This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

**Usage guidelines**

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

**About Google Book Search**

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

# SMELLIE
ON
# ELECTRO-GALVANISM

---

2/6

# A FEW OBSERVATIONS
# ON THE
# INFLUENCES
# OF
# ELECTRO-GALVANISM
# IN THE
# CURE OF CHRONIC RHEUMATISM, CERTAIN FORMS OF PARALYSIS, NERVOUS, AND OTHER COMPLAINTS.

BIBLIOTHECA BODLEIANA

By JAMES SMELLIE, Surgeon.

Second Edition.

LONDON:
WILLIAM HORSELL, 13, PATERNOSTER ROW;
AND
R. PEMBERTON JUN., 33, EUSTON SQUARE.

1858.

157. c. 193.

LONDON:
PRINTED BY BEARE AND JEALOUS,
GRAY'S INN ROAD.

BIBLIOTHECA BODLEIANA

# PREFACE.

It is impossible to avoid the fact, that many of the circumstances of the times we live in, are of such a nature as to be calling into a more frequent existence than before, those classes of diseases that are the product of the exhaustion of the nervous, and other forces of the human body, and are precisely those of that debilitating nature, as require the re-invigorating influences of some natural stimulus.

Certainly we have no agent of that nature for the cure of disease that can with more propriety, or with more safety be applied, and with more beneficial results, than galvanism.

The entire mass of literary and other professional men and women—the merchant, the speculator, and a number of other classes, coming within the same category—whose heads and hearts get the lion's share of the work, in place of the strong arm, and stout back, are the classes who are more peculiarly liable to those series of now every-day complaints.

It may be necessary to show that the claims of galvanism, as an active and highly useful curative agent in the treatment of certain classes of diseases, are founded on facts demonstrated by many of the greatest experimentalists of the previous and present generations, and are still demonstrable to those who will take the trouble, and have the perseverance to do so.

It is impossible to believe that the science founded on the discoveries, and adorned by the researches of Galvani, Volta, Valle, Aldini, the Herschels, Humboldt, Faraday, Noad, and a host of other names, alike great and illustrious in the annals of science, can in any way be allied to empiricism, or as the dreams of the mere specialists, but is rather in accordance with the rapidly-advancing progress of scientific knowledge, and that which is founded on truthful, experimental induction.

For the due administration of electricity, or any of its modifications, in the cure of disease, it is absolutely necessary that the operator should be in possession of an intimate knowledge of the science to which this agent belongs, as well as a perfect acquaintance with the mechanism of the human frame, and of the many diseases with which it is sometimes afflicted, whether they be of the functions, or of the structures, or both.

When in the hands, therefore, of the uneducated, in all matters of this description, it can be of little or no service, if not mischievous; and these very misapplications have too often been the means of bringing discredit upon an otherwise valuable remedy, instead of the blame being properly placed to the account of the ignorance of the operator.

52, Euston Road.

# CONTENTS.

Historic Sketch, 1—Nervous and Electric Fluids, 2—Galvanic Experiments; ditto by Vassali, 3—Electrophos of Volta, 3—Researches of Matteucci, 4—Views of Aldini, 5—Influence of Galvanism over the Contractions of the Heart, 7—Therapeutic Influences, 8—Is Electricity a Fluid? 9—Laws of the Distribution of Electric Force, 10—Decomposition of Water by Galvanism, 11—Importance of the Electric Fluid, 11—Muscular Currents, 11—Experiments of Dr. Pearson, 11—Positive and Negative Currents, 12—Phenomena of Vitality of Nerves, 13—Sensibility of Nerves, 13—Muscular Currents, Direction of ditto, 13—Application of Galvanism to Living Bodies, 14—Chemical Action; Electric Current, 14—Du Bois Raymond, 14, 16—Intensity of Currents, 15—Action of Currents upon the Nerves, 15—Chemical Action, Volta, 16—Chemical effects of Galvanism, 17—Effects of Heat; Inductive Power; Secretions, 18—Experiments of Warlmann, 19—Motion of Fluids; Phenomena of Thermo-Electricity; Magnetic Directive Power of the Earth, 20.

Sentient Nerves, 21—Thermo-Electricity, 20—Experiments of Moseate, 21—Muscle and Nerve, 21—M. Halle, Capacity of Bodies for Electricity, 22—Electricity and Magnetism; Capacities for Heat, 23—Transference of Nervous Force; Transference of the Muscular Currents, 24—Nervous Force; Existence of Electricity, 25—Electric Attraction; State of Electricity in the Atmosphere, 26—Nervous Force; Electric Fluid, 27—Dr. Golding Bird, Remarks, 28—Restorative Powers of Electricity, 29.

Dr. Barry's case of Alcoholic Apoplexy, 30—Galvanism a Curative Agent, 31—Signor Orioli on Manifestations of Life; Sir John Herschel; Lamboni, 32—Experiments of Volta, 33—Identity of the Nervous Fluid and Electric Force, 34—Reasons for the use of Galvanism, 35—Electro-Galvanism, 36—Stimulation of Galvanism on the Circulation, 37—Electro-Galvanic Battery, 38—Invigorating Influences of, 39—Dr. A. Clark's Experiments, 40—Dr. Wilson Philips' Experiments, 41—Use of Galvanism, 42—Electric Theory, 42—Use of Galvanism in various diseases, 44—Frictional Galvanism, 45—Therapeutic Influences, 46,—Amenorrhœa, Dr. Golding-Bird, 47.

Costiveness; Experiments of Aldini, 5, 48, 76—Spasmodic Asthma, 49—Humboldt's Experiments, 50, 58—Philips on Chronic Asthma, 51—Use of Galvanism in Difficult Breathing; Spasms of the Respiratory Muscles, 52—Eccentric Epilepsy, 53—Restorative Influence of Galvanism, 56—Electric Spark excites Sensation, 57—Electric Currents on the Action of the Intestines and Heart; Laws of these Currents, 58—Influence of Electricity on the Nerves and Muscles, 59—Paralysis of the Voluntary Nerves, 60—Paralysis, 61—Cases, 64—Paralysis of the Bladder, 65—General Paralysis, 66—Matteucci on Electro-Galvanism in Paralysis, 67—Voltaism, a Stimulant, 68—Hysterica Paraplegia, 69—Paralysis of Bladder, 70, 71.

Non-Secretion of Urine; Grove's Batteries, 72—Facial Neuralgia, 73—Aldini's Experiments, 5, 75, 76—Aphonia, or Loss of Voice, 76—Spasms of the Respiratory Muscles, 77—Aphoria, 78—Effects of Suckling; Æsthenic Uterine Leucorrhœa, 79—Spasmodic Affections; Cramps, 80—Inertia, Sympathy of Uterus and Mamma, 81—Spinal Irritation, 82—Spasmodic Asthma; Influence of Galvanism, 85—Cramps; Benefits of Galvanic Friction, 87, 88—Hysterics; Galvanism applied to the Neck, and Diaphragm, 89—Nervous Diseases; Electro-Galvanism, 90, 94—Motor and Sentient Nerves, 94—Method of Exciting Contraction, or of Sensation of a Nerve, 95—Observations of Volta; Electro-Galvanism in Weak Joints, 96—Electric Friction, 97-100—Paralysis; Galvanism, 101—Electro-Galvanism in Rheumatism, 104—Electricity exciting Contractions in the Muscles, 106—Electro-Galvanism as a cure for Tooth-ache, Ear-ache, and Face-ache, 107—Rheumatic Neuralgia Pains, 108.

Humboldt, Experiments on Himself, 109—Chronic Rheumatism, 112—Frictional Electricity, Application of, 113—Muscular Rheumatism; Use of Galvanised Needles in *Nevus Materni;* Indolent Tumours; Constipated Bowels, 115—Sciatica, 116—Galvanic Friction; Uterine Hemorrhage, 117—Gout, 118—Experiments of Fechner, 119—Electric Fluid as a Curative Agent, 120—Narcotics; Galvanism an Antidote; Electric Power of the Torpedo, 121—Hypochondriasis, 122—Electro-Chemical Effects on Hemorrhage, 124—Power of Galvanism in producing Contraction of the Circular Fibres of the Uterus; Evidences in favour of the Benefits of Galvanism in Flooding; Drowning, 128—Asphyxia; Voltaic Electricity; State of Sinking, 129—St. Vitus's Dance, 130—Deafness; Functional Derangement of the Ear, 131—Aneurism, 132—Indolent Tumours, 133—Enlarged Mammary Glands, 135—Chronic Mammary Tumours, 137—Scirrhus Testes, 138—Scrofula, 139—Ulcers, Benefits of Galvanism in the Cure of 141—Conclusion, 143.

# INDEX.

Page
Amenorrhœa . . . . . 47, 66
Asthma . . . . . 49, 52, 85
Action of the Electric Currents on Muscles . 74
Aphonia (Loss of Voice) . . . 79
Aphoria (Sterility) . . . . 80
Brydon . . . . . 2
Chemical Action . . . . 17
Connection between Muscle and Nerve . . 21
Capacity of Bodies for Electricity . . 22
Chloroform . . . . 29
Chlorosis . . . . 43
Costiveness . . . . 48
Cramps . . . . . 80, 87
Chronic Rheumatism . . . 113
Chemical Effects on Hemorrhage . . 124
Asphyxia . . . . . 129
Aneurism . . . . . 132
Chronic Mammary Tumours . . . 137
Distribution of Electric Force . . . 9
Debility . . . . . 38
Digestion . . . . . 39
Drowning . . . . . 128
Deafness . . . . . 131
Electrometer . . . . 5
Electric Currents producing Sensation in Animals . 9, 18
  ,, Force, Distribution of . . . 13
  ,, Attraction . . . . 26
  ,, Theory . . . . 43
  ,, Friction . . . . 94
  Condition of the Atmosphere . . 109

Page
Electricity, Positive and Negative . . . 14
,, and Magnetism . . . 23
,, Leatherhead, on . . . 105
Electroscope . . . . 20
Electricity and Magnetism, Capacities for Heat . 23
Electricity, Restorative Power of . . 29
Electro-Galvanism . . . . 36
Electricity and Voltaism . . . 68
Enlarged Mammary Glands . . . 135
ELECTROSCOPE—
Experiments of Aldini . . . 76
,, Galvani . . . 2
,, Fabroni . . . 2
,, Sultzer . . . 2
,, Vassali . . . 2
,, Volta . . . 5, 52
,, Swammerdam . . . 5
,, Dr. Downe . . . 5
,, Dr. Pearson . . . 14, 56
,, Dr. Golding Bird . 4, 29, 47, 75
,, Moscate . . . 21
,, Fechner . . . 119
,, Humboldt . . 6, 58, 109
,, Fowler . . . 6
,, Rheinhold . . . 8
,, Matteucci . . . 10
,, Du Bois Raymond . . 10
,, Volta . . . 11
,, Waarlmann . . . 19
,, Dr. Wilson Philips . . 41, 51
Electrophos of Volta . . . 4, 15, 33, 57
Epilepsy . . . . . 53, 57
Epilepsy, Eccentric . . . 53
Frictional Electricity . . . 113
Galvanism a Restorative . . . 29
,, in Alcoholic Apoplexy . . 30
,, a Curative Agent . . . 31
Galvanic Friction . . . . 87, 100
,, Needles . . . . 92, 115
Gout . . . . . 118

Page
Historic Sketch . . . . 1
Halle, M. . . . . . 22
Hysteria Paraplegia . . . . 69
„ cured by Galvanism . . . 89, 90
Heart, action after death . . . 5
Humboldt . . . . . 109
Hypochondriasis . . . . 122
Influence of Galvanism on the Blood . . 32
Identity of Nervous Influence with Electric Fluid . 35
Influence of Galvanism on the Heart . . 39
„ „ Digestion . . 39
Latent Currents . . . . 4
Laws of Electric Force . . . 12
„ „ Currents . . . 13, 58
„ Repulsion and Attraction by which Muscular Currents are guided . . 14, 17
Languor . . . . . 46
Leucorrhœa . . . . 79
Loss of Blood . . . . 127
Muscular Electric Currents . . . 12
Motion of Fluids . . . . 17
Motor and Sentient Nerves . . . 49
Muscular Electric Currents . . . 12
Nervous Currents, Transference of . . 24
Electric Fluid, Resemblance to Light and Heat . 19, 22
Nervous Diseases . . . . 90, 93
Neuralgic Pains . . . . 73
Noad, on Therapeutical Influences of Electricity . 106
Neuratic Sciatica . . . . 116
Narcotics . . . . . 121
Observations of Orioli . . . 32
„ Sir John Herschel . . 32
„ Lamboni . . . 32
Paralysis . . . . 58, 67, 104
„ of the Voluntary Muscles . . 60
„ „ Bladder . . 64, 67, 70
„ „ Facial Nerve . . 74, 90
„ „ Fifth Pair of Nerves . . 91
„ „ Nerves . . . 94
„ from Apoplexy . . . 101

Page
Paralytica Hemiplegia . . . 75
Phenomena of Vitality of Nerve . . 20, 27
Peculiar power of Galvanism . . . 19
Rhitter's Researches . . . . 26
Reasons for the use of Galvanism . . 35
Restorative influence of Galvanism . . 55
Sultzer's Experiments . . . 1, 5
Secretions . . . . 18
Sentient Nerves . . . . 20
Spasms—Respiratory Muscles . . . 52, 77
Stupor, recovered from, by Galvanism . . 30
Spasmodic Asthma . . . . 49, 85
„ Affections . . . 80, 82
Sterility . . . . . 81
Spinal Irritations . . . . 82, 83
Sprains . . . . . 92
State of Sinking . . . . 129
St. Vitus's Dance . . . . 130
Scirrhus Testes . . . . 138
Scrofula . . . . . 139
Therapeutic Influences . . . 7, 31
Thales the Discoverer of Attraction . . 1
Theory of Irritation . . . . 16
Thermo-Electricity . . . . 20
Toothache relieved by Galvanism . . 107
Tumours . . . . . 133
Ulcers . . . . . 141
Vassali, Experiments on the Heart . . 3
Vitality of Nerves, Phenomena of . . 13
Voltaic Pile . . . . 12
Water, Decomposition of . . . 17
Weak Joints . . . . 94, 98

# RISE AND PROGRESS

OF THE

# KNOWLEDGE OF ELECTRIC AGENCY.

Two thousand four hundred years ago, the existence of one of the properties of electricity (attraction), and as it exists in amber, was discovered by Thales, the chief of the seven sages of Greece. He believed attraction to be some latent spirit, ready at all times, to be called into more active existence by means of friction. Afterward came Theophrastus, a distinguished pupil of Aristotle. In his work on stones there is nothing worthy now of our notice, except that he exhibited the same property in tourmoline and other bodies. Pliny, also, recorded his knowledge of its existence. Largus, a Roman physician, was in the habit of immersing the feet of his patients in a bath wherein was an electric eel, for the cure of gout, and other diseases. Dr. Gilbert, an English physician, who lived in the fifth century, wrote a work on magnetism; and he therein showed that other bodies, besides that already mentioned, were possessed of the same property. We have also Fabroni writing on some matters connected with metallic irritation, with the peculiar title of "The General Theory of Pleasures." We have also about the same period Sultzer on the chemical action of the different metals on each other; still, little comparatively was known of electricity and galvanism till the days of Galvani, the distinguished professor of Bologna, who lived about a century ago. The knowledge of it therefore, as a great, vitalising, all-pervading power of nature, lay buried in the immeasurable depths of time for twenty-three hundred years.

From the simple experiments of Sultzer, with his pieces of metal—one of lead, the other of silver—joined, one being placed on the tongue, a taste like that of the sulphate of iron was felt; also those of Fabroni, on metallic irritation, and on the chemical action of the different metals on each other; to those of the medical student, Cologna, who, having killed a mouse, and in the dissection of it, touched one of the intercostal nerves with his scalpel, was surprised to find an electric shock sufficient for the moment, to benumb the hand; Vassalli, taking advantage of Cologna's experiments, imagined that nature is provided with means to present and retain the electricity accumulated in any given part of a living animal, to the end that she may employ it when occasion may serve.

Bridon and others affirmed that the nervous and electric fluids were the same; while some believed that the brain only is animated by the electric fluid. Galvani, while working with a galvanic machine in company with a friend, discovered that, by touching one of the crural nerves of a frog (after being dissected), that the muscle supplied by that nerve was instantly and powerfully convulsed. Struck with the singularity of the phenomenon, Galvani repeated the experiment, and the result was the same. He then repeated it while the machine was at rest, and found that no contractions ensued. From these he drew the following conclusions:—The necessity of a conducting body for the production of the phenomena; the advantages which result from giving a certain extension to the conductor to produce the contractions; the various direction of the electric influence, and the utility of the conducting bodies to the muscles; the efforts made to prevent the passage of electricity; and, lastly, that the communicated electricity is conducted through the substance of the conductors. The properties of the spark induced muscular contractions, and inspired Galvani with a wish to examine whether the battery of Franklin would be capable of producing contractions of a still more powerful description. His attempt proved ineffectual. He therefore tried negative electricity, and had recourse to the electropheros of Volta. He operated on living animals, and obtained weaker emotions than when the animals were dead. The same results followed on cold-blooded animals, as well as warm-blooded ones.

The numerous experiments of Galvani demonstrate that, among living animals, those are in general the best calculated to manifest the contractile movement who are of a more advanced age, as well as those whose muscles are of a whiter substance. He then tried whether the electricity of lightning would produce the same influence on the movements of the muscles. The results were precisely the same. He found that the contractions augmented with the intensity of the lightning, and to the proximity of the electrified cloud. The muscular contractions induced by the influence of a small portion of electricity, were strongly manifested by the experiments which led Galvani to his important discovery. In the living animal, when the muscles are under the will, the contractions induced by electricity are very feeble; with those muscles that are not under the will, it is otherwise.

Vassalli showed by experiments that the heart can be made to contract thirty or forty minutes after death has taken place; tending to show the identity of electric force with nervous energy. Vassalli noticed in his experiments that, if a ligature is applied close to the insertion of a muscle, it arrests the passage of electricity. On the contrary, if the ligature is placed at a distance, the transfer is uninterrupted, every part of the animal becoming contracted. He observes that, how extraordinary will it be, if hereafter it is found *that the electric fluid retards putrefaction, and resists the dissolution of bodies.* For the purpose of deciding whether the electric and nervous fluids are the same, he made the following experiments:—Having dissected fourteen frogs, the crural nerves of which he united in a single battery, and having put the battery in order, and established a communication, by means of an existing arc between the nerves and the muscles, he excited the electricity they contained, and consequently produced the shocks. At the moment of discharge, two small pieces of straw, in some measure separated from each other, and nearly touching the apparatus, were instantly brought into contact; the results consequently were the same as would have been obtained by means of an electrometer. He afterwards repeated the experiment with that instrument, and obtained very sensible signs of electricity, thus far demonstrating the identity of the fluids. This philosopher also demonstrated the fact that there is a double circulation of electricity in all living bodies. He also showed that the movements of the voluntary muscles are performed by a circuit of electricity, or electric battery; and that the other movements—those more especially which depend on the viscera—obey another law. He adopts the theory of an inherent electricity in the different parts of the animal organisation—the interior of the muscles being negative, the exterior positive. The arteries and veins are conductors; so are the muscles; but all being much less so than nerves. The tendons are not conductors of themselves. The lining membrane of bones are also conductors, but are not productive of movements unless they communicate with nerves. Galvani has incontrovertibly shown that electricity exists in a certain condition in every animal, which he denominates animal electricity. Recently Professor Matteucci, in his valuable researches, declares that this is really the case, and confirms the experiments of Galvani; but asserts that they were not original, being previously gone over by Swamerdam before the Grand Duke of Tuscany. Whether this is true or not, is not our wish to stop to inquire; and remark that the truth of these currents have been fully corroborated, just as the latent currents which are now acknowledged between the acid secretions of the stomach, and the alkaline fluids of the liver, between the stomach and the skin; the liver and the kidneys. Dr. Downe found that if a platinum plate connected with a galvanometer, be held in the mouth, while a second be pressed against the moist perspiring surface of the body, the needles will instantly traverse just as they are when acted on by an acid, and an alkali. These views were first promulgated by Aldini; he also proved that Galvani was correct, when he endeavoured to show that these states of electricity exist in all living animals, one neutral, and in a state of rest, the other positive, and in motion. This theory, it is supposed, will explain the peculiar phenomenon of the pulsations of the heart of a shark continuing for hours after its removal from the body of the animal. The author has witnessed these pulsations to continue for nearly two hours. I think there is little doubt but that this contraction was kept up solely by the influence of these latent currents. The existence of this current was distinctly proven by a very beautiful experiment by the late Dr. Golding Bird. The electrometer demonstrated the presence of one of the elements. This healthy compound he decomposed by drawing a comb through his hair. The principal item in an animal for the exercise of galvanism is the existence of a sensible fibre. The splendid experiments of Humboldt go to prove that the greatest effect is produced when the action of the galvanic fluid is determined to several large nerves. There is no doubt but that the union of the nerve with the muscle is necessary to the contraction. Humboldt showed, by a long series of experiments exhibiting the influence of galvanism over the actions of the heart; and he assures his readers that he was enabled to renew the action of that organ some hours after death. These experiments were made on frogs, toads, and lizards. While in Poland, he dissected the fishes of the Vistula, and excited contractions in the heart of these to such a degree, that not only iron and silver, but even copper produced changes in the pulsatious of the heart. He found in a galvanised heart, that the irritability is invariably the same whatever may be the point of that organ, to which the portion of muscle forming a part of the conductor is applied. This arises from a multiplied distribution of the nervous filaments in every part of its substance. Many of these experiments were performed by our highly-talented countryman, Fowler, even before Humboldt entered on this particular subject. In a highly clever publication, abounding with most excellent experiments, Fowler came to the conclusion that the *will*, has not the *power* of arresting the *contractions* produced by electricity, but, rather, on the contrary, that the *galvanic movements*, become more and more *powerful* in proportion as the will is less capable of controling them. He has some very pertinent remarks as to whether the nervous system in general, is subject to the influences of galvanism, or if it is confined to those only that are under the influence of the will. He took the heart of a cow, in a highly irritable state, recently killed, separated that organ from the body, the intercostal nerves being coated, while the contractions of the auricles were still apparent; the metals which, when brought in contact, did not appear to have any influence on those contractions, neither did they renew them after they had ceased. He found, however, that the currents of arterial as well as of veinous blood were to be seen distinctly accelerated by each application of the galvanic fluid. I have always found that the pulse became stronger and more frequent after the patient had been at least a quarter of an hour under the influence of the battery; and in a corresponding degree was the feeling of warmth diffused over the entire body. The effect of galvanism, when applied to some individual nerve, is very different to what it is when applied to the brain and spinal marrow. In the first instance, all the muscles to which the nerve is distributed feel the contractions; in the latter case, none of the muscles are brought to act, except those that are less or more immediately connected with the metals forming the battery. This connection may be either their origin, or from its nervous connection. The peculiar power of galvanism in rousing into activity the dormant energies of organic life, and that of giving healthful activity to parts that are in a torpid condition, at first induced a belief that it was a principle existing in itself, more subtile than electricity, to which it more particularly resembled. Galvanism is not one of those mysterious things, which influence the animal frame without affecting the external senses. Nothing exhibits its wonderful power more than the rapidity with which inanimate matter becomes decomposed through its potent agency.

The question of the therapeutic influences and manifestations of electricity, galvanism, and magnetism—the latter two being modifications of the first-named fluid—are still not sufficiently known and, as we believe, appreciated. Strange that its powers are neither doubted nor denied! but, as this subject is not yet one of the specific branches of medical education, with some at least it is rather passed over, partly in silence, as regards its beneficial iufluence in the treatment of disease. It is not enough to be told that it is a wonderful, as well as a powerful agent of nature, and that it may sometimes be useful; for there is a great deal more to be learned than that, before it can be used for any beneficial purpose as a remedial agent. To apply it successfully requires a perfect knowledge of the science to which it relates; and as regards the theory and practice, with a knowledge also of the instruments necessary for its elucidation. Without these requisites, there is little probability of success in the treatment, but an equal fear of injury being the consequence of its misappropriation. As a remedy for the cure of certain complaints it can be of no use in the hands of the uneducated; for, if there is one reason more than another why this remedy has not been more in requisition than it is, it is the circumstance that it has been for a long time principally in the hands of the non-professional. Why it has been so, and is still, is very difficult to account for. It surely is as legitimate a means as the great majority of medicinal ones that are in use, and its *proper application* would certainly be at least as scientific. It has one feature to recommend it, and that is, we can understand its *modus operandi*, and that is a great deal more than we can say of many highly-celebrated medicinal remedies.

The question has been freqtently asked, Is electricity or any of its modifications a fluid, or what is it? How is the human body first supplied with this agent, and how is that supply kept up in the system? It has been shown by carefully-conducted experiments, by many highly scientific-minded philosophers, that animal galvanism is formed in the body of the animal by its own integrate parts, of elements fitted to excite motion and sensation. Rheinhold, in some very valuable experiments on this subject, defines it to be a fluid applied to a living and organic part, and by which this part is made to react upon itself, according to the established laws of nature. It is unquestionably a fluid, but differing essentially from all other fluids, having properties of its own, and secreted by the animal itself.

When a living body is subjected to its action, all those effects arise which might be expected from the stimulating power of an active agent or principle; it does not in any way act by influencing the imagination.

Having hinted at the manner in which galvanism operates as an agent of nature on living matter, it at least enables us to have clearer ideas of some beautiful phenomena of nature, so far, at least, as they bear upon the economy of man, and indeed of organic life in general, and will give us additional proofs of the wonderful simplicity by which all nature's works are perfected.

The electric current, which, under certain conditions traverses a nerve, determines in it a change similar to that produced by the unknown force of the nervous system when it is there excited by external actions. It seems however, natural and just to suppose that this change effected in the disposition of the elementary organs of a nerve whether by the act of the will, or by the electric current, or other stimulants, is accompanied in every case by a species of current of the unknown force of the nervous system. The nervous fluid in this hypothesis is what we suppose heat, electricity, and light to be—viz., a peculiar vibratory motion of ether.*

A current of electricity passed in the line of the length of the nerve, excites it in such a manner as to produce either contraction or sensation. The latter (sensation) takes place if the current is transmitted *from* the extremities to the brain: the former (contraction) if the current is directed from the brain to the extremities. The direct current produces contraction when it enters the body, and sensation when it ceases. Heat, mechanical, or chemical action, may, like electricity, excite the nervous energy, and thus produce sensation and contraction. In this view, we are to suppose light, heat, and electricity to be a peculiar vibratory motion of ether, existing in all parts of our nervous system, as in everything which we know of in the universe, diffused, and, in some bodies, having a particular arrangement, as in crystals.

---

* Noad's Electricity, p. 460.

The action of electricity on the muscles and nerves produces two kinds of contractions. According to Matteucci, the first, which he calls idiopathic, is the result of the immediate action of the current on the muscles; and the second, the sympathetic, arises from the action of the electricity on the nerves which preside over the motions of the muscles. Idiopathic contractions are necessarily produced in whatever direction the current of electricity passes; but the occurrence of sympathetic contractions must be governed by the direction of the passing current. They can only take place when the electricity is transmitted in the direction of the ramifications of the nerves. The shocks then experienced, when the current is transmitted from the shoulder to the hand, are more powerful than those passed in the reverse direction, because, in the former case, the electricity is transmitted in the direction of the ramification of the nerves, and in the latter, in the contrary direction.

The laws by which the muscular currents are guided seems to be, according to Du Bois Raymond, any point of the natural or artificial longitudinal section of the muscles is positive, in relation to any other point of the natural or artificial sections. By means of this law, it is very easy to understand why the muscular currents in one instance appears to be an upward, in another a downward one, according as the under or the upper of the two transverse sections is made to touch one of the ends of the galvanometer wire, whilst the other end is applied to the longitudinal section of the muscle. According to this law, every particle of musclc, however minute, ought to produce a current in the same manner as a whole or a larger piece of it.

The experiments of Volta and others go to show that a current, when acting on the nerves of sense, merely go to excite the peculiar action belonging to each of these nerves—viz., when the optic nerve is acted on, whether the current is intense, or otherwise, a sensation of light is perceived. The auditory nerve, when similarly acted on, a hissing, or a kind of jerking noise is felt, which continues all the time the current is being applied. A taste of sourness is felt when the tongue is traversed by a current however weak. So it is when a current is made to pass down the cardiac and splanchrogul nerves, the action of the heart and intestines is increased, not immediately after the application, but a short time succeeding, and continues after the current is withdrawn.

If it is the case that every substance in nature contains its natural quantity, it must be true that every atom of our bodies has its natural share; and if it is also the case that the atom has a tendency to assume polarity when its resident fluid becomes disturbed by another atom of a dissimilar kind, then by this reasoning, electricity may have the power over the composition and decomposition of bodies.

In old people and the debilitated by disease, it is supposed the nervous system loses much of its conducting power, which is known by the fact that a shock of electricity across the chest that will affect a young and vigorous person, will not so affect an aged individual; at least, very likely not further than the elbows, if felt to any great extent. We therefore find three concurrent and co-operating causes—a diminution in the natural quantity of electric fluid generated in the body of the old person, during the more enfeebled chemical action, exposure to a negative atmosphere, and an impaired power in the nerves.

All these will account for the circumstances of men being able to bear stronger shocks or streams from a Voltaic pile than the generality of females can do; and also explains why in old people it is necessary to employ a stronger current than what is at all necessary or beneficial in the young. And farther, it is found that it requires a much longer time in producing the same series of phenomena in old persons of both sexes, than is requisite for the same results in youth.

May not those currents passing from the outer to the inner surfaces of muscles, in conjunction with those that the blood, and their inclosing coats are known to be endowed with, explain what muscular irritability is, and account for the phenomenon of the contractions and dilitations of the heart of the shark after being removed from the body of the fish.

If this theory of irritation be a correct one—and the many experiments made on the subject by Matteucci and Du Bois Raymond go to show such to be the case—and prove that these muscular currents have an independent existence, at least so far as the nervous energy is concerned, then we can understand what muscular irritability is, and how it is continuously supported.

We have had frequently to refer to the various currents passing through the body, for the purpose of supporting the functions of organic life; it may not be out of place to state more precisely the nature of their existence, as well as their situation, at least as far as regards some of them. Matteucci lays down the following as the laws by which muscular currents are regulated:—

1. The intensity of the currents varies according to the temperature of the medium in which they have lived.

2. Their duration after death is so much the less as the animal is raised in the scale af creation.

3. The intensity varies with the degree of nutrition of the muscle, and is always strongest in those muscles which are gorged with blood and inflamed.

4. They are altogether independent of the integrity, and activity, of the motor, and sensorial nervous systems.

5. The influence of narcotic poisons is null, or very feeble on this current.

6. That the current proper of the frog persists in its intensity and direction without the spinal cord, or the spinal and crural nerves, and even if the animal is deprived of all the nervous filaments of the muscular mass of the thigh.

7. That the electric motive element of this current is confined to the muscles of the leg, and of the thigh organically united.

It seems to be a law in the economy of nature in the distribution of electric force, that the intensity of the currents in the body rises in proportion to the rank the being holds in the scale of animated nature, and the duration of these currents after death, being in the inverse ratio. There is another law, that those bodies which have the greater affinity for oxygen become positive; while those which are the least so disposed acquire the negative form. It has also been assumed that this chemical action of affinity may be some modified existence of electricity.

The same power which communicates attraction and repulsion properties to masses of matter, may, when acting on the ultimate particles of matter of different bodies, induce them either to separate or unite, as their natural electric states are the same or different, just as two positive bodies meeting repel each other.

If we are to consider positive electricity like as a jar filled with condensed air, and the negative as of a vessel filled with rarified air, then we have the analogy complete, bearing in mind, however, that the mere increase of quantity gives power or force. The whole phenomena of the various currents continuously passing from individual parts of the body, to that of others, is based on, and obey the same laws, in carrying on the many functions necessary for the well-being and continuance of life. Man in this case, as well as in some other particulars, present the same routine of circumstances, subject to the same laws, lives and has his organic existence by the same agents as those of the inferior animal creation.

It seems evident, from many well-authenticated and carefully-conducted experiments that have been made, that the effects of galvanism are almost invariably different on the diverse parts of animals, and that multiplied experiments on this subject exhibit a tolerably correct appreciation of the respective forces of the extensors, and flexor muscles thereby induced.

We also know that, on the application of galvanism to living bodies, oxygen is yielded at the positive pole where albumen coagulates, and where a frothy acid is found. At the negative pole we find hydrogen, with a liquid alkali. Is the acid and the alkali the product of the decomposed salts in the living body, and are they the direct effect of electric force, or are they rather the cause of those electric currents?

Dr. Pearson, in his experiments on the decomposition of water by means of electricity, contends that, after it has separated the water into its compound gases, it assumes the state of caloric. Galvanism has a much more powerful influence in decomposing water than electricity has. May not this action, or some one similar, be one of the energising forces exhibited by this fluid in its influence over digestion?

There is much evidence to lead us to the belief that the heart is endowed with the power of transmitting through its cavities positive and negative currents of electricity, and in conjunction with the sanguine fluid. The effects produced by those currents in the blood must be directly proportional to their respective intensities, and inversely to the resistance they meet with in their respective paths. This resistance is the same both in arteries and in veins. When these currents act with great intensity upon the blood in the pulmonary vessels, the actions of the heart become correspondingly increased. These phenomena affords a means of ascertaining the electric condition of the blood, as regards its intensity. A knowledge of this phenomenon will also guide us as to those times we can introduce currents into the system generally with safety, and with benefit to the patient.

The importance of the electric fluid in the systems of the world, is confirmed by a consideration of those phenomena in which it is concerned. There is nothing in nature that is not influenced by its power and energy, either directly or indirectly.

When the discoveries of science, says Mr. Brydone, are further advanced, we may find that what we call sensibility of nerves, and many other diseases which are only known by name, are owing to the bodies being possessed of too large or too small a quantity of this fluid, which is perhaps the vehicle of all our feelings.*

---

* Adams' Essays on Electricity, p. 399.

That there are muscular electric currents existing in the bodies of animals we have incontestible evidence in the fact, that by introducing into a recent wound of a living animal, the nerve of a prepared frog, in such a way that the extremity of the nerve should touch the bottom of the wound, and another the edge, the frog instantly contracts. These muscular currents can be detected in some animals after death; in some a longer, and in others a shorter time, but when once they have ceased, it cannot be renewed. When this has taken place from drowning, suffocation, or strangulation, or whatever the accident of this kind may be, neither electricity nor galvanism will avail, and may in some cases account for these agents failing, when all other circumstances seemed favourable for the successful application.

Till some positive evidence be had of the existence of this current still being intact, it would be hazardous to give a favourable opinion in cases of this description. These currents are found to move from the interior of the muscle to its outer surface, or from the interior of the muscle to any conducting substance on the surface. It does not appear that the nervous system has any influence either on the direction or intensity of the muscular currents.

The current of the nervous fluid produces sensation, if directed from the extremities towards the brain, and *contraction* if directed *from* the brain towards the extremities. From thence it follows, that an electric current traversing a nerve *normally* can produce no phenomena. The direct current produces *contraction* when it enters, and sensations when it ceases. The inverse current, on the other hand, produces sensation when it enters, and contraction when it ceases.

The phenomena observed during the first period of vitality of the nerve, show, that when the derangement of the nerve is perfect, its molecules are deranged in every direction by the application of any kind of stimulant, but always more so in the direction of the electric current, than in the opposite direction.

Every chemical action produces an electric phenomenon, and every solution, however diluted it may be, being of a chemical combination, it follows that, in the act of evaporation above a solution, the combined elements by separating, produces the converse chemical action—that of decomposition; and hence an electric phenomenon, with signs contrary to the act of combustion. The reason why electrical phenomena are not manifested during slow evaporation, or even during the boiling of water under simple atmospheric pressure, according to Peltier, is that the vapour is not separated with sufficient suddenness from the rest of the liquid, to carry away and retain the electricity of the chemical action of its separation, the neutralisation by return being made with too much facility in the moist atmosphere touching the surface of the liquid.

When water and certain saline solutions are made part of the electric circuit, so that a current of electricity may pass through them, they are decomposed—that is, they yield up their elements in obedience to certain laws.

Water is resolved into oxygen and hydrogen gases; and the acid and alkaline matters of the neutral salts which are held in solution are separated, not in an indiscriminating manner, but the oxygen and the acids are always developed at the anode (positive pole), and the hydrogen and the alkaline bases are given off at the cathode (or negative pole).

It is necessary to show how those currents act, and what effects they produce on the blood, and where.

The very minute quantities of iron in the blood must be of sufficient amount to enable the positive and negative currents to pass in opposite directions. These two forces are supposed to possess generating properties, and, in their reciprocal actions, unfold a new power. The effective actions of these powers may take place where oxygen enters into the blood. It seems also probable that the nature and disposition of the electric currents which pass from the heart, and through the blood in the vessels of the lungs is to decompose, or change the entire mass of blood as it flows through the vasa vasorum. When the electric currents act with great intensity upon the blood, the actions of the heart are in a corresponding manner increased. This change affords a means of ascertaining the condition of the blood in all cases where its electrical intensity is either above or below the healthy standard. In every change the polarisation of the particles of the blood is the antecedent condition, and this polarisation can only take place where magnetism exists; every part of the blood must, therefore, be endowed with magnetic power. Heat increases these currents in a ratio with its intensity, but has no influence over magnetic force. Heat acts upon these currents in different ways in the blood, and consequently sustains all the rythmical motions of the body by their influence, preventing them from their being in equilibrio and coming to a state of rest. The changes which heat and cold produce in the blood must take place at the negative electrode. It is also probable that electricity is the inducting motive-power in the blood, and the thoracic viscera;—that the light crimson blood (arterial), is electro-negative, otherwise the fœtus would be electro-positive in relation to the mother, which is not the case.

It is only negative which can harmonise with positive vessels and produce corresponding effects; all the secretions of the body are negative in their relation to the blood. The effects produced by these electro-magnetic currents in the blood must be directly proportional to their respective intensities. The chemical action of a current of electricity is always definite, and directly proportionate to the absolute quantity which circulates. Volta discovered that the passage of the electric current through the organs of sense excites corresponding sensations. This current, according to the direction it traverses a nerve, is the only stimulant that has alone the power of exciting separately, sometimes contractions, sometimes sensations. The electric current alone whilst traversing a nerve transversely, produces none of the phenomena due to the excitability of the nerve. The electric current alone occasions the continuation of the excitation of a nerve after its action upon it has ceased. The electric current also possesses the power of re-establishing the excitability of a nerve, when it is transmitted in a direction contrary to that of the current which had destroyed or weakened this excitability.

*The electric current is of all stimulants that which possesses for the longest time the property of arousing the excitability of a nerve,* however weak it may be, compared with other stimulants. From these conclusions it appears that the mode of action of the electric current upon the nerves is more simple than that of other stimulants, and is at the same time analagous to the unknown force which works on the nervous system.

The muscular electric current is a phenomena which has been proved to derive its origin from chemical actions constituting the nutrition of the muscles. The nerves have not a direct influence on these currents. The development of electricity by a crystal of tourmouline when heated, clearly proves the relation between heat and electricity. So it is with light; they all seem to run in parallel lines of relation to each other.

From the experiments of Wartmann, it seems certain that the motion of fluids is from the positive to the negative poles, at least as regards water.*

Where there is left in the prepared frog the spinal cord, its nerves, and their ramifications through the muscles, these nervous parts act in the production of the current in the same manner as the muscular substance of the thigh.

Since the phenomena of thermo-electricity seem to account in a satisfactory manner for the general distribution of electricity and magnetism over the earth, the interest attached to this peculiar development of the subtle agent we have been engaged with is exceedingly great. That the earth may be considered a great magnet, the phenomena of the dip of the needle sufficiently shows; and the facts connected with electro-magnetism lead to that conclusion.

The magnetic directive power of the earth is in a direction nearly parallel with its axis, and is derived from the thermo-electric currents, induced in its equitorial regions by the unequal distribution of heat there present, and depending principally on its diurnal motion.

There is every reason to believe that the sentient nerves of the lower extremities are in a positive state, and the superior extremities negatively electro-magnetic; that the magnetic circles of our bodies are subordinate to the atmospheric magnetic circles; that the variations in the daily changes in the earth's magnetic force produce corresponding changes in the magnetic currents of our bodies. The twinges felt in the stump of an amputated limb indicates that the weather is about to change to an opposite state; there is a sense of a tremulous motion similar to that feeling known by the name of sleep. The twinge felt is of momentary duration, such as would be felt from an electric machine, and generally comes on a few hours before the change of weather takes place.

---

* Noad's Electricity, p. 458-9.

The electric fluid, when set free and in motion, is a stimulus to the animated fibre; and the effect of its irritation while actually pervading that fibre, consists in a sensation, or motion produced in it. The muscular fibres constitute the most sensible electroscope, and show the presence of an electric stream which is not able to disturb themost delicate electrometer.

The intimate connection between nerve and muscle is clearly demonstrated by the fact, that whenever a muscle is divided near to where the nerve is inserted into it, every movement will cease, in spite of every attempt to bring the divided ends of the muscle together. Moscate, in some highly-interesting experiments, placed two frogs under an exhausted receiver, and deprived them of life; the result of which was the production of small movements following each other in rapid succession, but attained with some difficulty. He repeated the experiments, to show that the ligature he had applied to the nerve close to its insertion to the muscle impeded the movement. He then placed the ligature at a distance from the muscle; the movements returned with every part of the animal becoming a conductor.

They were manifested, however, so soon as he gave his hand to the person, the finger of the other hand being on the nerve, thus completing the circle. Electricity is an imponderable fluid, so far as science yet teaches us, found existing in everything that is inanimate, as well as in all animated existences. It is one of the most powerful and sublime assistants in keeping in glorious harmony our planetary system. "Whether we progress over ocean's trackless way, or ascend earth's highest pinnacle, there we still find it existing, in all its unchanging and unchangeable existence; if we survey earth's utmost bounds, it presents itself at every step of our inquiry; the atmosphere which we breathe from the first moment of our existence, to the ceasing of the heart's last throe, and in truth, by which we live, is at all times impregnated with it, in a greater or less degree; in the rudest winds which sweep earth's and ocean's surfaces, or the calmest breeze which fan the face of man, it is alike present; the clouds which float over our heads are all in some degree impregnated with its power, and directed by its influence; if we descend and examine ocean's vasty deep, even there we find its inhabitants endowed with the wonderful properties of this universal agent; and man, the lordling of creation, fears its power, as he is affected by its alternations. When it is in a state of deficiency in the atmosphere, he is weak and enervated; in its superabundance he is irritated and excited, and even sometimes destroyed. If we examine our atmosphere of an evening, with its bright and starry sky, there we find it exhibiting its grandeur and its glory; as in the thunder-storm, we behold it in all its terrific power and magnificence. Like light, heat, air, and moisture, it is as necessary for the health and existence of all of us. One of the conclusions of the celebrated philosopher, M. Halle, is, that the influence of the state of the atmosphere, and of surrounding circumstances, may be very powerful in the more or less successful production of the galvanic phenomena. This is so true that in our every experiment the primary consideration ought to be ***the state of the atmosphere.***

When we consider that every diseased condition of an organ, will in a corresponding degree vary its capacity for electricity, thus we find in inflamed surfaces that there is an excess of this fluid, or in a positive state, while parts are in an exsanguineous condition, are always negative; so it is with the system generally, when in this condition there is always a paucity of this life-supporting principle. Hence the languor, mental depression, and great debility while in this negative state. It is thus evident that, to employ this agent with safety and with benefit to any given organ implicated in disease, a perfect knowledge of these altered conditions is absolutely necessary. It must also be borne in mind that in those days when the electric force in the atmosphere is negative, a corresponding deficiency of nervous power may be expected in nervous people; therefore, in that negative state of matters, the patient will require a much larger amount of stimulus from the battery than when the surrounding air is in a state of tension. Attention to those matters is absolutely necessary to give the remedy a proper chance of doing that amount of good which, under proper management, it might with all probability be expected to do.

It is often urged that medical men are far too chary in availing themselves of the advanced state of the natural sciences, and that there are other agents of great value that might be equally successful in the cure of disease, with those of the most boasted medicinal ones.

The galvanic fluid, although differing in degree from electricity and magnetism, is governed by the same laws, and exhibits in the great majority of instances nearly the same phenomena. The change or difference seems to be chemical, and is evidently produced by the secretions from the inner surfaces of the vessels through which it is carried. The same may be said of that portion existing in a comparative state of rest, or slow currents, in the intermediate spaces of the muscular system. The difference between the three modifications seems in some measure to depend on their different capacities for heat, the galvanic fluid having the greater capacity, magnetism the least of the three states. In the application of galvanism to the human body, there is a large amount of heat evolved. The pulse becomes strong and full, the skin hot, which frequently is followed by gentle perspiration.

The transference of nervous force or vitality from one individual to another seems to account for the fact of children who are in the habit of sleeping with the aged, suffering thereby a depreciation of their general health.

Dr. Copeland mentions the case of a pale, sickly child of about five years of age, but who appeared to have no specific complaint. There was a slow and remarkable decline of the general health and energies, which his mother termed a general blight. It came out that he had been a remarkably stout and plethoric child up to his third year, when his grandmother, a very old person, took him to sleep with her. He soon after lost his strength and good looks, and that he continued to decline ever since, notwithstanding medical treatment. He directed that he should sleep apart, have gentle exercise, change of air. Now, it is necessary that the theory of this phenomena should be clearly understood and appreciated. In very old people, the quantity of electric force in the system is minus or negative in degree, assuming that by the terms negative and positive, we simply mean the former as the smaller, and the positive the greater quantity, and, as a consequence, having the greater force. The stout, healthy, and blooming child, when taken into comparison with its grandmother, is in a state of positive electric force. This is known from the larger amount of nervous energy and the greater activity of the circulation. When, therefore, the body of the child is brought into juxtaposition with that of the very aged person, the consequence will be a series of currents passing from the child to the old person, till the body of the child has lost as much of its nervous force as to bring it into a negative state, the old individual receiving just as much stimulus as the child had lost.

May not such nervous force induce electricity in any glandular or other organ, just as magnetism in motion will excite electricity? Thus accounting for what cannot be questioned, the existence of certain currents in certain organs, exclusively excited by, or depending for, their existence upon the integrity of the nervous influence of the part. It has been remarked by Humboldt that galvanism affords a mode of estimating the degree of excitability of a nerve or a muscle, and that galvanism will never throw a greater light on practical medicine than when its doctrines are studied in that point of view.

It may not get rid of many of the difficulties in physiology, but it will furnish a means of explaining some of them in a more satisfactory manner than hitherto. All the experiments he has made on this subject, together with the variety of facts that have been adduced, and which lead to observations of the highest importance, relative to materia medica, and the chemical properties of vitality, would have been for ever lost to him, had it not been for the attempts made to ascertain the state of the nerves by means of metallic irritation.

We have said that electricity exists in everything in nature; that in man it is in a positive state, in the female, negative; that alcoholic liquors increase its intensity. Its equilibrium is very easily disturbed by the most trifling means, either mechanical and chemical; it is even developed by the inequality of heat, which goes a certain length in explaining terrestrial magnetism. Even the process of respiration disturbs it, and the quantity evolved during that act is very great indeed. This subtle fluid is capable of acting on matter in two different modes; in the one, it exhibits an attractive power on bodies at a distance, which may be called ***electric attraction***, in the other, it only influences matter when they are in proximity. This is sometimes termed its electro-polarity, and from this property some have assumed it may have acquired its chemical properties. By its power of attraction it is capable of producing a variety of motions, and that, under peculiar circumstances, intense light and heat are evolved by it.

The continuous existence of electricity in our atmosphere, in lesser or greater quantities, at all times and seasons, has a corresponding influence on all organized being; and the more perfect and symmetrical the organisation of the being, the more sensibly affected it will be by the deficiency or superabundance of this vital agent. How much of the health and comfort of the entire human race depend upon these mere alterations of this vitality in our atmosphere, and how much of our personal feelings depend upon this simple fact? A great deal more than the generality of mankind would willingly believe. Such however being the case, let us inquire by what means it produces disease in our bodies, and the modus operandi in its application in curing these diseases.

In the dark, wet, dreary days of winter—in those days when there is great deficiency of electricity in our air—how depressed and uncomfortable do the majority of people feel; and the invalid in particular feels its depressing influence in a corresponding severe degree. In the country, you see the cattle gathered up into a corner of the field, listless to an extreme, finishing a picture of entire monotony profound.

Ritter, in his "Researches in Medical Electricity," found that the actions of life are increased by the influence of positive electricity, and that the negative pole diminishes those actions. There is much probability, also, that the increased energy of one organ causes, or is accompanied by diminished action in another organ.

The intimate connection existing between our nervous fluid, and the electric condition of our atmosphere, is well exemplified in the painful feelings of people who have corns on their toes or feet: few old women in the country who are so afflicted, but can tell from long, and painful experience, as certainly as a barometer will, of the impending storm; so it is with the majority of those who have the misfortune to lose a leg, or an arm, the painful twitches down to where the extremity of the lost limb were wont to be, are so painful, and so certain to be always produced by the altered electric state of the atmosphere, that they can be relied on nearly with the same certainty as the barometer.

I had a patient who had his leg amputated at the thigh, and he could tell from ten to twelve hours before a change of from dry weather to wet, and whether that change would be a severe one or not. When the alteration in the quantity of electricity was great, the twitches were more severe, and much more frequent. They were felt in the toe of the wooden foot; strange, but true; the limb would start, and quite inadvertently would the hand be thrown down to the foot to give it support under the spasms, for such they really were, just as if the foot of flesh and bone was still in the proper place. These are doubtless electric actions, and shows incontrovertibly the influence which a plus or a minus quantity of electric fluid in the air has over our nervous force.

The phenomena exhibited by the nervous system when in action have often been compared to the electric and galvanic fluids. There are certainly many points of analogy, and without pushing the comparison too far, or giving way to exaggeration, it may be affirmed that the result of the various experiments made on the spinal marrow by some of our greatest experimentalists, tend to show that sensibility, at least, is connected with this portion of the nervous system, exactly in the same manner as the electric fluid is connected with the metallic conductors which are destined to transmit it.

The remarks made by the late Dr. Golding Bird are very much to the purpose. He says, "May I ask, may not one of the uses of electricity so freely developed in the body, especially that existing in the muscles, be to excite in the nervous chords, the nervous principle or polarity, just as currents passing through a bar at right angles to its axis excites magnetism? May not this nervous principle, or nervous polarity, excite the contractions of a muscle without actual contact with its fibres; and we know that the fibrillæ of nerves lie upon, but do not communicate with, the ultimate fibres of muscle, just as the invisible lines of force from the bases of a magnet act upon the suspended bundles of wire or iron filings without being in contact with them?

This fluid differs in some degree according to the nature and class of the animal. From these premises it follows that each organ has the power of secreting the fluid most necessary for its functions. It is also transmitted from one animal to another. Aldini showed this to be the case by laying bare the sciatic nerve. The muscular parts of the thigh and the paw were brought into contact with the denuded nerve. The contractions ensued in the same way as if the galvanic circle of metals had been formed. Having requested one of his audience to hold a frog by its muscular parts, and applied his finger to the nerves, without giving his hand to the person in question, the contractions did not ensue.

Having attempted to show the connection existing between the electric fluid and nervous energy, it will, therefore, be as well to try and explain in what manner electricity produces disease. It may do so either by superabundance or by a diminution of its natural quantity; by being turned aside by natural causes; or by having its course completely reversed in diseased parts of the system. It is, therefore, found that disease is as frequently produced by its superabundance, as well as by its deficiency in the atmosphere as well as in the human body. It has long been remarked by medical men who have visited hot climates that epidemics are always preceded by heavy rains, with excessive quantities of thunder and lightning, with dark, thick electric clouds coming from the south. Dense, detached clouds were always certain precursors of cholera. We all know how lightning sometimes destroys life; and we can understand how an excessive quantity, in surcharging the atmosphere, will bring on disease by destroying the healthy equilibrium of this fluid in the system, just as the extremes of heat and cold are prolific sources of disease.

Its restorative powers are well exhibited in the recovering of patients sinking from the overpowering influence of chloroform. So it is in cases of drowning, and in many other forms of suspended animation, is its energising influence over organic life put to the test of experience, and in many cases found to answer the most sanguine expectations. There can be little doubt but that the healing art has both been enriched, and rendered most useful in relieving the demands of suffering humanity by the assistance of electro-galvanism. Its similarity to the nervous influence, the power we have of getting this influence transmitted through the very channel of the nerves themselves, gives this agent advantages which no other remedy possesses. When we also take into consideration the great rapidity with which it can be transmitted over and through all the body, that it can be exhibited at times that the patient is either totally insensible or so very low as to be deprived of the ability to swallow medicine of any description whatever, we must be led to confess that in galvanism we have one of the most powerful, safe, and useful remedial agents at our command, that can be exhibited to the patient, whether sensible or insensible—the child as well as the adult can with security receive the healthful impressions of its life-like energising principle. We have also strong evidence of its possessing this principle in a high degree, from its power in sustaining life, even while the body is under the narcotic influence of over-doses of opium, and of laudanum. Among the many cases that might be cited to prove this fact, we shall only quote one or two cases, one by Dr. Barry, of Ellenburgh, who relates the case of a child who was dying from an over-dose of laudanum: when he first saw it, the child was in a state of almost hopeless stupor; but being kept under the influence of electro-galvanism for upwards of five hours, till the effects of the laudanum had fallen off, the child was saved.

Dr. Golding Bird had a similar case of an adult, in a state of deadly stupor from opium; he also employed electro-galvanism in a similar manner with precisely the same results, that of keeping the patient partially awake, till the influence of the opium had disappeared. Its value in these otherwise most fatal cases is of the highest importance.

In cases of alcoholic apoplexy we have had several cases, where patients were suffering from over-doses of ale and stout, and have found galvanism an excellent and safe means of recovering from this dangerous disease. Its powers of restoring patients to a state of sensibility are extraordinarily great.

Galvanism has claims as a general, as well as a special restorative, which no medicine, however powerful it may be, can at all be compared with. We can have its stimulating influence made to bear on the spinal chord, and in a more indirect manner upon the brain itself, along the course of the majority of the nerves of organic life; through that channel, we have its stimulating influence most palpably exhibited over the action of the heart, and the circulation generally; the whole muscles, and ligaments of the body are directly acted on by its influence over the muscular currents; all, or any of these can be brought under the immediate stimulation of this most potent agent. What are all the farago of linaments, oils, and embrocations when compared to this, if the comparison would not be too ridiculous to make? It is frequently an aspersion cast on the medical profession, that they are fonder of pouring in drugs into the body, than a taking advantage of our improved knowledge in the sciences. Why this taunt should be thrown out at the members of a learned profession, is not our province here to inquire, it is enough that such is the case. It cannot however be doubted, that the age of curing disease by the mere exhibition of drugs is fast passing away, and the system of employing all the means that the present advanced state of science affords us, rising more and more in the estimation of the medical profession, and of the public generally.

The success of galvanism as a curative agent will in all times depend, in no small degree, upon the knowledge and the talents of those who direct. Considering the indifferent attention it has received, it is not at all surprising that many complaints in which it has been used has proved refractory; while the same agent, in more skilful hands, —very possibly in precisely the same routine of diseases,— would have produced the most satisfactory results.

This is no imaginary picture, but one which those experienced in the difficulties of the appliances of this science to the treatment of disease, will most readily admit.

It may in all justice be asked, In what diseases will galvanism be available as a means of cure? As a general answer, it may be stated that, in all cases of sheer nervous debility, from whatever cause, or whatever forms it may appear in, it may be used with great advantage, and with much safety. The same may be said in regard to muscular weakness, as well as constitutional debility. Its power in infusing strength, and energy to both the nerves and muscles of the body, is self-evident from the nature of the agent employed. The question only is, How, when, and where it is to be applied? and this can only be done by the experienced medical man.

Signor Oriali contends that all the manifestations of life are actually dependent upon a series of galvanic combinations, existing in every part of the body. He regards the glands as made up of such a series of combinations and polarities. He believes that disease depends upon an excessive, diminished, or abnormal condition of the electric polarities of the respective organs. He proposes to treat these several morbid conditions by artificially removing their unnatural electric conditions. Sir John Herschel believed in the possible relation between galvanism, electricity, and the nervous life; and hints at the brain being either the organ of secretion, or at least of the application of this agent. Lamboni remarks, that if the brain be an electric pile, constantly in action, it may be conceived to discharge itself at regular intervals, when the tension of the electricity reaches a certain point, along the nerves which communicate with the heart, and thus to excite the pulsations of that organ. May not this be the active agent which keeps up the regularity of the circulation, assisted by the electric state of the blood. Venous blood when exposed to the action of galvanism soon acquires the brilliancy of arterial blood. This fluid, parting with its heat and electricity, in the course of its circulation through the body, for the purpose of sustaining animal life, again acquires a darkened tinge. Animal heat and electricity is supposed to be united together in the body, in such a manner, as the electric with the nervous fluid circulating in the nerves.

The experiments of Volta and others go to show that the blood is endowed with the principle of animal galvanism, by the fact of the incitability of animals, is made in a great measure to depend upon the quantity of blood they may have lost, or to the suddenness of their death. Those which have been killed most suddenly, and lost the smallest quantity of blood, being more incitable, than in those cases where the loss of the sanguine fluid was more profuse. This doctrine explains why galvanism is so useful in one of the most dangerous of all hemorrhages, that of uterine; its use in these cases is not only highly rational, but is based on principles which are both highly probable and scientific, and of which we can understand its rationale of operating.

It is not for this person, or that individual, to tell us they have no faith in the usefulness either of galvanism or electricity, and at the same time confess they do not know anything at all about it, for they do not think it worth wasting their time upon. Such is an every-day answer; the unfairness of persons of this class giving an opinion on the matter is apparent enough. It may in all justice be asked of those who have no faith in this remedy, Have you given the study of the science of electricity and its phenomena, presented in its action on the human body, a careful and well-extended series of observations? Are you acquainted with these phenomena both in health and disease, so as to give a full and a fair trial to the remedy in review? We all know that, first experiments very frequently fail, either altogether, or in producing those results that were either anticipated, or said to be produced by others; not from any fault of the instruments or their powers, but simply that we did not know how or where to apply them for the purpose of producing those beneficial results insisted on as produced by others. Now, this is simply the case as it stands, as the fate of almost every one while on the very threshold of experimental philosophy; and it ought to teach us a lesson in being more careful in condemning agents as remedies, because they have failed in our hands in producing any favourable results. Instances are numerous of this kind, where two or three hurried and badly-arranged experiments were made and wrongly applied, failing, of course, in doing good,—was quite enough to bring discredit for a time, not upon those who mismanaged the matter, but upon the remedy. It is also a curious fact, that the belief in the beneficial influences of this remedy, in the cure of certain forms of diseases, is nearly, if not altogether confined to those who have given the science their more particular study and attention. This fact ought to go for its proper value, and, in some measure, to silence the doubts, and encourage the unsuccessful. Let us take care that we do not be found as drags on the chariot-wheels of scientific improvements,—while we as jealously watch that our deductions in the use of remedies, of whatever kind they may be, be made with care, without bias of any kind, and in the same spirit which enabled the great master-minds of experimental philosophy to carry out the ennobling works allotted to them.

From what has already been advanced, showing the identity of electricity, and the nervous influence with their similarity of results; of the existence of muscular currents through every part of our bodies where these tissues are situated,—from these and other premises advanced, it follows that electricity, or some of its modifications, are indicated as remedial means in all cases of deficiency, or irregularity of those currents, whether in the nervous cords or in the muscular tissues. The diseases produced by these irregularities are many and complicated ; yet, where no positive organic mischief has taken place, electro-galvanism can be used with much safety, ease, and likelihood of doing good: and the reason is, that in using this agent, we are using one so entirely alike to that in which there is the deficiency.

Can there be a greater recommendation than this, or can we say as much of many other medicinal agents we use? Certainly not; none that has the close identity with at least one of the active principles of our nature than it has. Contrary theories may be advanced, and tirades may be directed against the believers of these doctrines, but they can do nothing in breaking down those positions that are founded on numberless experiments, made with the utmost care, by many of the greatest experimentalists that have ever existed.

The reasons why electricity or its modifications claim a place as active and beneficent agents in the cure of various diseases are—

1. That in every action in life it is either an active agent in its production, or is one of the products evolved in the result.

2. That between the nervous fluid and this principle, there is a close analogy, both in their phenomena and in their mode of action.

3. That the muscles of our bodies are supplied with electric currents, whereby their muscular power and energy is sustained.

4. That these currents, under great muscular exertion, carried to fatigue, become exhausted, passing from their inner to the outer surfaces, thence through the skin.

5. That in the air we breathe it is at all times present, and performs an important part in the lungs in the function of respiration.

6. That in every chemical change, electricity is evolved, or is an agent in producing the change.

7. That heat and light are at all times impregnated with it.

8. That in the performance of the functions of digestion, and assimilisation, there are continuous currents passing between the stomach, liver, kidneys, and the skin.

9. That our bodies are at all times sensibly affected by its atmospherical changes, from a healthy or natural quantity, to that of superabundance or of deficiency.

10. That it is a great agent of organic life.

Electro-galvanism has within these few years made some advances in public and professional opinion, as to its curative and remedial powers in disease. The nature of its influence, the class of diseases it most likely will be successful in, with the situation where its influence can be most beneficially transmitted, are all become better known and appreciated, and is now giving this all-pervading agent of nature, that position as a safe and beneficial remedy in the cure of disease, which its intrinsic merits justly entitle it to.

On the other hand, the more powerful the agent (when guided by the skilful mind) the greater will be the corresponding beneficial influences effected.

A moment's consideration will show that a great deal of the value of galvanism lies in the mode of its application—as well as in what cases, as well as in the stages of these cases, it is to be applied with any prospect of success. The operator must understand where to apply it properly, how long each patient will bear the application with benefit, and when it can ultimately be laid aside with safety. All these require the utmost consideration and attention of the operator, and without which little beneficial result can be expected. There is also the age, sex, and temperament, as well as the state of the general health to be taken into consideration; for we find that the young, the nervous, and the sanguine, receive the impressions much more acutely than the phlegmatic and the aged. To apply the same force in all these cases, and to employ it for the same length of time, would neither be safe, successful, nor judicious.

To suppose that, because a few applications of galvanism may for the time restore to a weak organ, or the constitution generally to a state approaching to healthful activity, and because it does not continue to sustain it in that integrity, that the remedy is of no avail, would be very unreasonable indeed. It is only by the continual infusing of that energy into the part for a necessary period, and by stimulating thereby the entire ligamentary and muscular structure of the joints, and by infusing into the currents more electric power, and to the nervous fibrillæ more energy. It is thus evident that a steady and well-conducted series of applications of this kind will in time produce more muscular strength, and firmness, rendering the joint fit for all the purposes for which it was intended. We could cite many cases, where, after the patient suffering years of discomfort, and an inability to move any distance without a great deal of pain and fatigue, in a few weeks, or in as many days, the pain on movement lessened, and a complete cure was effected. Such decided success in cases that were all but hopelessly incurable without these means, is enough to guarantee the safety of the application, and also the necessity of having recourse to the same means when opportunity occurs.

The stimulation of galvanism upon the circulation, acting through the nervous influence, is very well shown by the converse, where there is temporary arrest of the heart's action by any violent shock received by the nervous centres originating from without—as in accidents, or in the brain itself, from violent emotions. Sometimes the heart is even paralysed by the shock, and death resulting. The exhaustion produced by strong nervous excitement requires much care in the treatment, the result of the excitement not being the same in two cases. In general it is better to strengthen the nervous centres generally, and afterwards to apply it locally wherever it may be considered necessary.

There are cases of debility occurring in the advanced state of convalescence. In this condition, stimulants have the effect of lowering the pulse; and in this state will the administration be admissable and be found very serviceable in the restoration of the general health of the patient. No doubt but it will require the same care in its use as in that of any other stimulant, where there is a great deal of extreme debility, such as is produced by the of loss an excessive quantity of blood, and no positive organic mischief to contra-indicate its use. These streams, from a rather strong electro-galvanic battery will be highly beneficial, and will be received with a feeling of refreshment. Here its power on the heart's action can be made immediate—a matter of the greatest moment. Under its influence the activity of the heart is increased, and sustained in that condition, keeping the various functions of life going, and thereby affording time for whatever farther means may be deemed necessary to the recovery of the patient. A remedy having these properties to recommend it, cannot be too highly estimated.

Where we have exhaustion of the nervous force from, and accompanied with, local functional derangement, such as sometimes supervenes in convalescence from various febrile diseases, bad habits of life, and various other debilitating causes, galvanism requires to be introduced into the system in a much more diminished force, and for a much less space of time, than is required in the case of debility from loss of blood. Doubtless, debility from fever, or from over exhaustion, or from over mental fatigue, may require the assistance of galvanism for a longer time, though not as regards one particular application, but rather as to the frequency of applying it. At each sitting, before laying it aside, it is applied to both hands, the positive pole being placed in the left hand, the negative in the right. We generally find that, to keep the patient under its influence ten or fifteen minutes does a good deal of good.

It is of much importance to excite a great amount of nervous power and energy by this means; but, to suppose that any permanent good is to be received from a few applications of this remedy, would be altogether fallacious, and would certainly end in bitter disappointment. There is no doubt, also, that the remedy would get the blame, in place of the ignorance of the operator.

From what has been insisted on in these pages in support of the invigorating influences of electricity when judiciously employed, it is therefore in accordance with these principles, that we can strongly recommend it in all cases of pure functional debility, and in doing so, we could record many instances where its invigorating influences were most beneficially manifested, and felt.

Its employment in no way interferes with whatever other means the patient's ordinary medical attendant may consider necessary, it will rather be found a most valuable assistant in the invalid's recovery.

When we consider that the functions of digestion, assimilisation, and absorption, all in a great degree depend on electric and nervous agency, we can very well understand that when these functions are arrested—say, by a paralysed state of the capillaries, or from whatever cause it may be, if we stimulate these enervated organs with that stimulus which is so nearly allied to that already existing in the body, we are thereby restoring to the enervated organs that amount of healthful energy which they had been deprived of, and endowing them with that amount of vitality necessary for carrying on the functions allotted to them. In cases of muscular, as well as of nervous debility, even when amounting to paralysis, not, however, in any way connected with organic alterations of the brain, we have been in the habit of using electro-galvanism, and have always found it answer the purpose better than any other remedy. Generally when applied in weak streams of from half-an-hour to an hour at each sitting, sometimes repeated every day, in other cases only every alternate day. In those very numerous and often troublesome cases termed nervous, whether arising from long-continued mental exertion, grief, irregular living, peculiar changes going on in the constitution, or whatever the exhausting causes may be, we have found electro-galvanism to answer the purpose remarkably well; at least, in the great majority of cases we have availed ourselves of its assistance. It would be mere quackery to employ it in every case, without reference to many collateral circumstances which may present themselves.

The positive pole we generally place either in the neck, or about the fourth or fifth cerveal vertebræ, the negative to either of the feet, near to the toes; the sponge for the muchæ is generally dipped in hot salt and water previous to applying it.

Dr. Alexander Clark, in repeating the experiments of Dr. Wilson Philips, tried in one a comparative weak, and in another experiment a strong power. In the former, although the galvanism was not of sufficient force as to occasion evident digestion of the food, yet the efforts to vomit, and the difficulty of breathing (constant effects of dividing the eight pair of nerves) were prevented by it. The symptoms recurred after it was discontinued, but vanished on its reapplication. The respiration of the animal (he observes) continued quite free during the experiment, except when the disengagement of the nerves from the tin-foil rendered a short suspension of the galvanism necessary. The non-galvanized rabbit wheezed audibly, and made frequent attempts to vomit. In the latter experiment in which greater power of galvanism was employed, digestion went on as in Dr. Wilson Philip's experiments.

It has long been the opinion of many eminent physiologists that there is a close analogy between electricity and the vital fluid, and that the phenomena of life have an electric origin. Others again, such as Dr. Wilson Philips, consider that there is a strong analogy between electricity and nervous influences, but do not go farther with the other party in their belief. The many experiments made by the Doctor and others, leaves no doubt but that electricity or galvanism can be used as a substitute for nervous energy. This view is supported by the fact of the beneficial results which have been obtained by galvanic treatment in cases arising from sheer nervous debility, and the consequent want of tone of those organs which these nerves influence.

There is no doubt but that the stimulating power of galvanism is capable of rousing the vital powers, even, when they are in a state of dangerous dormancy, and that too, with a greater promptitude and energy than any other remedy. The influences of the eight pair of nerves on the functions of digestion, secretion, and respiration are well known and acknowledged; and through the immediate channel of these nerves galvanism is made to have an immense power over the functional diseases of these organs. The obstinacy of several varieties of biliary attacks, and of constipated bowels, will be made to yield by the power of galvanism in promoting secretion, and stimulating the muscular fibres.

Almost in every individual case in the ordinary forms of this disease, some particular symptom attains a preeminence by its severity over all the others. These peculiarities will require their own treatment.

In the use of galvanism in this complaint, we have found it answer best either in the morning after breakfast, or about two hours after dinner. When used in the morning, the patient will occasionally have a feeling of hunger, a desire to eat; and where there is loss of appetite, the morning will be found the preferable time for the application. The time it will require to be continued will depend entirely upon the severity of the case, as well as its influence on the individual: under any form, there is no doubt, but it will be found one of the most valuable adjutants in the cure of this most troublesome and stubborn complaint. When it has assumed a chronic condition, and the health of the patient has suffered accordingly, then the difficulty of the cure is strictly corresponding to this state. From what has been already said regarding the identity of the electric fluid to nervous energy, and of its powers in stimulating the absorbents, we are prepared to find its usefulness in this complaint, as well as in all others where there is a deficiency of nervous force. It was upon those bases that Dr. Wilson Philips made his experiments on the pneumagastric nerve, and where he succeeded in showing the close identity between electricity and nervous influence. He showed that when the nerve in a rabbit was divided, after partaking of a hearty meal, the food remained undigested, whilst in allowing an electric current to traverse the course of the nerve to the stomach, digestion was readily effected. The Doctor believed that electricity was capable of performing all the functions of the nervous system in the animal: whether this is the case further experiments are still necessary to show. The mode of its exciting digestion is supposed to arise from its decomposing the saline ingredients of the food; the acids are set free, the latter being the active agents.

The electric theory will in some measure explain the cause of the sense of weight felt over the stomach, after eating, the pain, distension, sickness, heartburn, and the acidity, with a host of other troublesome symptoms, that are the almost constant attendants in the ordinary forms of this most troublesome complaint. It cannot be expected that galvanism will do all that is necessary to be done in the disease, either as regards dietetic, or medicinal remedies. A strictly well regulated diet, most religiously attended to, is most urgently necessary, without that, no remedy will be of any service. In the weak, nervous, and debilitated, the quantity of galvanism to be administered becomes a matter of careful consideration and attention, so that no more or less be given than the whole circumstances of the patient admits of, and requires. You have frequently patients under great suffering, and sometimes obliged to live in a manner bordering on starvation; to relieve such wretchedness as this is an object of the greatest importance, and he who can do so, is well worthy of the approbation of his fellow men.

Chlorosis, or green sickness, is a disease of debility, confined in general to young females, and occurring before, or immediately after the change of life, and depending in the great majority of instances upon that circumstance. There is a low depressed condition of the nervous system, and as a consequence, a great debility of the circulation, with an altered state of the blood, containing less of the colouring matter, and also of the solid matter or clot. There is a dullness of spirits, palpitation of the heart, and great general debility. There is also loss of appetite; indeed, a depressed state of the whole body. The eyes, lips, and entire countenance become changed. This disease is one which comes entirely in the category of those that are precisely of that kind of general, as well as nervous debility, that will at all times receive the utmost benefit from the judicious use of electro-galvanism. Considering the time of life that it occurs, with its attending circumstances, we can very well conceive that there is a great demand on the constitution for nervous force. We have been in the habit of using it with the patient every alternate day, each sitting occupying from half-an-hour to an hour. It is better to apply the positive to the various portions of the spinal column, and the negative over the heart, or it may be over the uterine region. Those circumstances, however, will require to be varied according to circumstances; just as the other parts of the treatment will. In many cases of ordinary severity, the patient will require the assistance of some medicine, to remove whatever combination, or complication, that may be found existing. These cases yield very kindly, and in general very readily to the refreshing and stimulating influence of electro-galvanism.

In the complications which are numerous, we may instance the headaches, hysterics, cough, with difficulty in the breathing, palpitations, constipation, pain and tenderness of the side. In others there is menorrhagia, or leucorrhœa, and in others again hemorrhage. In some cases there is an entire absence of the crasamentum, in fact, a bloodlessness peculiarly characteristic of one form at least of this disease. In the hysteric form, we may have convulsions more or less severe, in others, there is spasmodic contractions in various forms. It would be endless to enumerate all the phases that this very common disease may assume, but enough has been said to show that in whatever form it may appear, or be made to assume, we believe that electro-galvanism ought to be the sheet-anchor on which our hopes depend for a cure: whatever medicinal treatment it may be requisite to combine with it, will not in any way interfere with the beneficial influences of this agent. Let no one be so foolish as to suppose that, it is quite sufficient to get it applied once or twice, no matter how it is done; for if they do, it will only end in bitter disappointment, and bring discredit on the remedy, when it ought not to do so.

One of the accompanying symptoms of this disease, that is the pain in the left side, requires treatment for itself. Frictional galvanism has in all the cases that has come under our notice, sufficed in a few trials, in no case exceeding a dozen applications, to give complete relief from this very annoying symptom. The old plan of local, and sometimes general bleeding, must have in many cases, complicated the matter not a little, and could not in any way whatever be of any benefit to the patient.

When the patient is in a state of debility, so as not to have blood to spare for the purpose of menstruation, there can be no better way of relieving them from this state, than by strengthening the nervous and muscular systems through the introduction of electro-galvanism into the system; this I consider is beginning at the proper quarter for the patient's recovery,

In chlorosis we have a train of symptoms all declaratory of great want of nervous force. There is the sallow-coloured countenance, the nervous headaches (as they are called,) palpitations of the heart, dullness of spirits, and in some cases, there is the absence of the catemeniæ. This symptom alone is a complication of the utmost importance.

Each individual case presents its own peculiarity of symptoms; in many the functional derangement of the bowels is a leading feature, from their extreme sluggishness; occurring as it generally does in the more delicate of the female sex, and arising from a variety of causes, such as, protracted menorrhagies, hemorrhages, leucorrhœa, anxiety, fatigue—all debilitating and deteriorating causes.

From the languor, drowsiness, sense of weakness, giddiness, with pains in the hypochondria, or the cardiac region, or perhaps in both, impaired appetite, confined bowels, pulse rather weak and rapid, and easily disturbed. Apart from whatever may be done to combat some of the individual symptoms, such as the torpidity of the bowels, and the dyspeptic symptoms, much can be done in rousing the dormant state first of all of the nervous system generally, and of the local currents in the various parts of the system. For that purpose the spinal axis with its nervous distribution will require the utmost attention, so that those organs which exhibit by their symptoms, the greatest deficiency of nervous energy, may be made to receive through their roots, the stimulating influences of galvanism. If the liver, or the stomach, or bowels, are in fault, then we have the pneuma-gastric nerve to be acted upon; or if the heart or uterus require special attention, the same mode of healthful stimulation can be carried out. So it will be in reference to the state of the nervous system generally; if there is great nervous debility, there the electric galvanism will require to be applied to meet those deficiencies. We have always found it to answer all the circumstances of the case, to begin by placing the sponge from the positive pole in the left hand, and the negative in the right hand, and after the patient feels warmer, with gentle perspiration breaking out, with an improvement in the state of the pulse, then we begin to apply to the roots of those individual nerves indicated to be in fault; if the root of the nerve cannot be got at, then its trunk must be made to receive the primary stimulation; allowing the currents to be passed down through the nervous distribution to their termination; the sponge from the wire attached to the negative pole, is better to be applied to the lower margin of the epiagstrium. In menorrhagia the streams will require to be passed through the body of the uterus, and followed also by frictional electricity.

Amenorrhœa may in all justice be classed as a disease of debility; whether the female has ever menstruated or not, still there is the same absence of force. It matters little whether the patient may be weak and nervous, or dull and sluggish in her temperament, yet she must be stimulated. In the weak and nervous you have to do everything possible in the way of giving large quantities of nutriment, with wine or other stimulants. These are altogether to be considered as independent of the peculiar influence that the galvanism will have in restoring the monthly evacuations. The nourishment, &c., will assist in improving the general health.

No medical man knew the value of galvanism in bringing on the menstrual discharge more than the late Dr. Golding Bird, and very few used it so much as he did in those cases, and generally with distinguished success. He says, "In galvanism we possess the only real direct emmenagogue with which the experience of our profession has furnished us. I do not think I have ever known it fail to excite menstruation where the uterus was capable of performing that function. Disappointment will most certainly result if we have recourse to electricity merely because a girl does not menstruate." He must never lose sight of the fact that, after all, the large majority of cases of amenorrhœa depend upon an anæmic condition; and the patient does not menstruate simply because she has no blood to spare. A few shocks transmitted through the pelvis seldom or ever fail in effecting menstruation.

We can with confidence give this statement of opinion, (based on large experience,) our entire acquiescence, as being in perfect accordance with what has been our experience in the use of galvanism in this disease. It is safe, easy of application, can be used with the most nervous with perfect impunity, and without any inconvenience to the patient whatever.

There is no better way of making more blood than by invigorating the nervous system, and the functions of digestion, and assimilisation. There seems, in my opinion, no readier way of doing this, than through the influence of galvanism.

Costiveness.—When arising from a torpid liver, the current will require to be passed through the body of that organ; healthful secretion is promoted thereby, an impetus is given to the secreting vessels, the tone of the liver is restored, and constipation of the bowels relieved in an easy and satisfactory manner, without in any way further disturbing the general health of the patient. If necessary the colon can be stimulated by the application of galvanic friction over the region of that organ, and by placing the positive electrode over the lumber region, and the negative to the rectum.

The experiments of Aldini led the way to the knowledge of the effects of placing a plate of zinc in the mouth, attached to a copper wire, with a piece of silver at the extreme end of the wire, and introduced into the rectum; the effect being the emptying of the bowels. In a physiological point, it is interesting to observe the peculiar heathful influence galvanism has when made to traverse the line of force observed by the nervous chords, and the muscular fibres; it is then ten times more efficient: but a weak current produces often a great effect when so applied. Whereas, were the current reversed, and ten times the intensity of it employed, still it would fail in producing those healthful results that the weak current will do, because the former is acting in opposition to the natural forces, while the latter in accordance with them, and had only to fill up that amount of stimulation necessary for carrying on the functions of life with health and energy. When the costiveness depends upon mere enervation, or a deficiency of muscular force, then the action of galvanism when thus applied, will be very beneficial; but when it arises from a want of nervous, as well as muscular force, the application must be made to the constitution generally, as well as locally for the disease. Frequently this purpose will be best accomplished by applying the electrode from the positive pole to the neck, and the negative made to traverse the lower portion of the abdomen, and occasionally applied to the anus. Emetics, we know, when given in small doses, act as purgatives, but they do so by relaxing the entire muscular fibre, and thereby induce debility; not so with galvanism, it acts as a natural stimulant; it thus has the power of exciting the secretory vessels, as well as acting on the peristalic motion. In costiveness, with extreme irritability of the bowels, and perhaps of the stomach, then in addition to the usual application of the galvanism, it will be well to employ the galvanic friction, and sometimes to draw sparks from individual points. Constipation, when depending on any organic defect, ought not to be interfered with by galvanism.

Spasmodic asthma, occurring in paroxysms, unaccompanied with congestion, or inflammation of the bronchial tubes, but understood as depending on spasm of the muscular air cells. Its dependence on nervous disturbance of the true spinal motors, as the circumstance of it being frequently depending on hysteria, tumors pressing on the par vagina, peculiar odours, &c. Galvanism is used not only to prevent the paroxysm coming on, but if not applied in time to prevent the attack, it can be used with much advantage in shortening its continuance. When applied as a cure for the complaint, then its use will need to be daily—the application of the positive wire to the spinal cord, and occasionally to the pneuma-gastric nerve. Its stimulating influence on the bronchial cells is well shown in the relief afforded to asthmatic patients, while suffering from the paroxysms of that disease. Its influence over the heart, and arteries, is exhibited in the improved state of the pulse, when used in the above cases. Humboldt showed, by a long series of experiments, that galvanism had a distinct influence over the movements proper of the intestines, and on the pulsations of the heart. He showed also that the influence of galvanism is not limited to the time of its commencement, and passage through the body, but that it is continued for different lengths of time according to the attending circumstances. The stimulus of galvanism from its great energy, and analogy to the nervous influence, is capable of rousing the debilitated vital powers, with greater promptitude and energy, than any other known agent. In asthma it is used with considerable benefit to the patient; and it is generally remarked that in fifteen minutes' application of a moderately strong stream, from the muchæ to the lower margin of the heart, they felt their breathing much more easily performed—the cough easier, and altogether felt better, is the usual answer. It is remarkable that in several who had laboured under this disease for many years, it gave the same relief as it did in cases of recent standing. The morning—when the breathing is difficult, and the cough troublesome—is the better time for applying it.

Dr. Wilson Philips was in the habit of using galvanism in cases of asthma with decided success: the continued current he preferred, and strongly recommended it to others; his method was, to apply a silver plate in the nape of the neck, and one of zinc to the epigastrium; and, connecting them with the wires of the galvanic trough, the former to the positive, and the latter to the negative pole; relief usually occurs in from five to fifteen minutes, with the negative to the inferior surface of the diaphragm, and continued for at least three quarters of an hour, or an hour each time; the current will be better if of low intensity, but large in the quantity. A steady perseverance in this mode affords great relief, both in arresting many of the paroxysms from coming on, and also in releasing the patient from the sense of suffocation, and feeling of edrestriction round the chest. In certain states of the atmosphere, where there is no paucity of electricity, with easterly winds, it is always desirable to employ it morning and evening. If there is any complication existing, then these must be treated on their own merits apart altogether from the galvanic treatment.

Dr. Wilson Philip's method of treating habitual or chronic asthma, was by applying discs of silver to the nape of the neck, and a zinc plate to the epigastric region, and then pass the positive wire of a galvanic trough, consisting of from eight to ten pairs of four-inch plate, charged with very dilute hydrochloric acid against the former, and the negative against the zinc: relief usually occurs in from ten to fifteen minutes.

Experience seems to teach us, that neither confined air in the lungs of a living animal, nor artificial respiration upon a dead body, have the power of changing the colour of the blood in the lungs; that in respiration the inspired air must undergo a change before the colour of the blood becomes altered in its tinge, and that the change that takes place in the inspired air, is an electric phenomenon, and consequently that respiration is an electric action. By this theory we can understand why galvanism is so highly beneficial in asthma, and more especially during the paroxsyms; and why the most inveterate case of long standing, receives for the time, the same relief, as one of the most recent description. It also shows the propriety of using it often, especially in the mornings and evenings. Those who have witnessed (as we have done) the relief afforded by the use of this current to the breathing in cases of asthma, will at once assent to the reasonableness and propriety of the treatment. In some cases where the feeling of suffocation was most imminent and most distressing to the poor patient, as well as painful to those around to look on, galvanism restored them, in the course of an hour's application, to a state of comparative ease and comfort. In one case, for an entire winter, the patient was every morning to be saved from a condition bordering on strangulation; his life was saved for the time, and a large amount of ease and comfort enjoyed, which under any other treatment could he find the same relief.

That galvanism has the same energizing influence over the entire muscular tissue, is very well exhibited in cases of asphyxia in the lower animals. Some interesting experiments by Humboldt, and also by Valle on this subject, are both highly interesting and very instructive. Pullets, after being apparently dead from drowning, were restored by means of electricity; frogs, who had been suffocated by hydrogen gas, were reanimated by the same means. Anschel tried the same experiments, and was similarly successful.

Spasms of the respiratory muscles is a peculiar affection of the respiratory movements. There is spasm of the diaphragm, with pain at its several points of attachment:

there is inability to articulate, with the body bent forward. The fits come in paroxysms, but exists to a considerable degree continuously. The evidence adduced as to this disease having its origin in a disturbance of the spinal motor nerves, is, that the spasms in general do not exist during sleep; and that they are increased by any cause which excite, or disturb the mental functions. The negative pole will require to be placed over that portion of the diaphragm which is pained, the positive to be in the neck.

Eccentric epilepsy may be considered as a functional disease, having its existence in the excitor nerves, and involving also those of the motors, and in some degree the spinal axis itself. In many cases it is connected with a morbid state of the stomach or the bowels, or it may be irritation of the uterus. Whatever the after treatment is, the removal of the cause or causes, is an important primary duty. When occurring before the age of puberty, it is more likely to have a successful termination, than those coming on after that period. Electro-galvanism can be made applicable to the case, by applying it to the spine, to the head by drawing sparks, or by acting on the pneuma-gastric nerve, or all of these combined, if necessary.

Where it seems to be connected with, or accompanied by a morbid state of the stomach, and where there is an insatiable desire for food, an excellent opportunity occurs for trying its influence through the pneuma-gastric nerve, and for this purpose the positive electrode should be placed across the neck so as to intercept it in its passage downward—the negative being situated over the lower edge of the stomach. In this way I have found it of essential service in establishing a healthy state of the digestive function. When the uterus seems to be implicated, the positive being placed over the lumber vertebræ, and the negative to the lower margin of the uterus, streams are thus made to traverse through the body of that organ, and by the position of the negative, can be made to detract from, or add to, the nervous influence of this important organ, as the nature of the *laison* may require. Whatever individual organ may, through its reflex action, act upon the excitor, or motor nerves, or even the spinal axis itself, so as to produce convulsions, the effect upon those nerves, and axis, must not be forgot, for the nervous exhaustion produced by the fits calls for the assistance of this energizing influence, called galvanism. By this medium only, can we supply the deficiency caused by the convulsions.

Every part of the system suffers less or more under the depreciating influence of this distressing complaint. The greatest care must be taken in removing everything which has the most remote tendency in keeping up the nervous excitement. It will be well to allow the patient early in the morning some healthful stimulant, such as strong coffee; for it is found there are more frequently fits in the morning when the stomach is empty, than at any other period. The condition of the general health must be carefully attended to, as a matter that cannot under any circumstance be omitted.

We have seen in some aggravated cases of long standing, the fits would, under the influence of the galvanic treatment, suddenly become very much diminished in number and severity, often not more than one in the day time, and none during sleep. Often on some little error in diet, they would be as frequent and severe as before. When this error is corrected, if the patient is kept under the influence of a current of the lowest intensity for at least four hours every day, the fits will then very likely become entirely arrested; still it will be necessary to continue the treatment for some time after, so as to sustain the nervous energy in its entire integrity.

I have seen while preparing the apparatus for a patient, that a fit would supervene, and on promptly applying the positive electrode to about the fourth, fifth, or sixth cervical vertebræ, and the negative to the mediastinal, and the current applied rather intense, the convulsions would almost instantly become arrested; the current must then be very much reduced, and continued for a longer time than ordinary, till in fact the patient is relieved of the consequent exhaustion, and feels refreshed and strengthened.

The progressive restorative influence of galvanism cannot be better exhibited than in the history of a most inveterate and confirmed case, at present under treatment. Percy L., a young man aged 20, while in a situation about seven years ago, that required his carrying heavy loads on his head, became subject to fits of epilepsy, and which very soon assumed so severe a form as to oblige him to leave his place. Since that time, he has continued subject to them, was in some hospital for nine months, but received very little relief; he has also been eighteen months under the guiding hand of some quack, who kept him under the wonderful influence of contryerva and elecampane, which of course did him no good. He had on an average nine or ten fits every day, and as many during the night. His appetite was voracious, indeed, almost insatiable. He was immediately put under the daily influence of electro-galvanism, but was frequently unable to attend from the fits being so severe as to incapacitate him from walking. In six weeks the fits were reduced to not more than five in a day, and three during night; they were also much reduced in their severity, and did not occupy so long a time when they did come. His appetite had become much more moderate; his countenance was losing the dull vacant appearance which it of late had, and his former childish manner was also rapidly disappearing. He was now able to walk a mile or two without being fatigued. In ten weeks they were reduced to an average of two during the day, and one during the night—are still more reduced in severity—general health much improved—is now cheerful, and has lost his childish manner altogether—remedy continued every day for an hour, and sometimes for an hour and a half, the patient being very fond of it, feeling that it is doing him so much good. In four months they had entirely left him. The galvanism is now only continued twice a week, simply for the purpose of sustaining the excitor and motor spinal nerves in their integrity. The only medicine used was the iodide of iron.

When applied to the head, it is done by isolating the patient, and drawing sparks from the crown of the head. In the other methods, the positive electrode is placed over the cervical vertebræ, and the negative over the lower edge of the diaphragm, or into the popleteal space. The currents will require to be at all times of low intensity, not stronger than the patient can just feel them; to be continued for not less than an hour daily. In the majority of cases, except those that are got at an early stage, not less than six months' application will be necessary for the cure. The galvanism will in no way interfere with whatever other medical treatment may be considered expedient.

The following case of cure of an epileptic patient by galvanic treatment is related by Dr. Pearson in the *Revue Medicale*, vol. iii, p. 333—The cuticle having been removed by a blister from the neck, and the inner side of one knee, those parts were covered with bits of moistened sponge, upon which slips of linen were laid, and over all discs of silver and copper, the former being applied to the neck, the latter to the knee. The discs were than connected with a copper wire, and enclosed in a pouch composed of chamois leather, so as be isolated from the adjacent parts. This apparatus having been applied for six months, the case was cured. It was found to continue in action ten or twelve hours, after which it became necessary to clean the plates, and renew the pledgets of sponge and linen. The same benefits will be derived by merely applying cloths dipped in salt and water, in place of blistering the surfaces. It is necessary that the zinc plate be always some distance from the silver plate, and near to the spinal column. There can be no question but the careful application of electro-galvanism will go far in assisting to restore tone and energy to the nervous system generally.

It may be well to remember that, in all cases where there is either irritation of the brain, or in the spinal cord, the use of galvanism is entirely contra-indicated, no benefit can be derived from its application in any form, but rather the contrary. The same precautions apply precisely to that variety of paralysis, where there is permanent contractions of any of the muscles of the paralysed limb, or where rammollesment of the brain is at all suspected; neither can it be used with any advantage where there is rigidity of any of the arteries, but must rather be guarded against, for it is the indiscriminate use of this remedy that has so often brought it into disrepute. These views will be well to be remembered in the treatment of paralysis of every description, and a guide as to when voltaic electricity ought to be applied; when sensation is to be acted on and aroused, and also where our appliances should be when we wish to excite the contractions of a limb, or muscle, or a series of them; the absence of this knowledge in the treatment of paralysis will afford perhaps a key to the many failures in the treatment of these diseases by means of galvanism.

Volta discovered that the electric spark in its passage through the organs of sense, excites corresponding sensations; he also found that the continued passage of the electric current through a frog, weakened its action in the direction of the current, while it was still very strong while traversing the animal in a contrary direction.

The action of the electric current on the movement proper of the intestines, and on the pulsations of the heart, were discovered by Humboldt. He had the courage to remove the skin from parts of his own body by means of blisters, and to subject the blistered part to the action of the metallic arc. His experiments on the secretions from the wounds formed by the blisters are exceedingly curious. He proved on himself that the action of the electric current was not limited to the sole instants of the commencement and the end of its passage through the parts. It does not appear that the integrity of the nervous system has any influence either in the direction or intensity of the muscular currents, for when all the great nervous filaments were carefully taken from ten prepared frogs, a differential current, or only a very feeble one was obtained, by opposing a pile of such frogs to another of an equal number of elements from frogs in their normal state. The same was the case with pigeons and other animals.

1. The intensity of the current varies in cold-blooded animals in proportion to the medium in which they have lived for a certain time.

2. Its duration after death is so much the less, as the animal is elevated in the scale of creation.

3. The intensity varies with the degree of nutrition of the muscle, and it is always strongest in those which are gorged with blood, and inflamed.

4. It is altogether independent of the integrity and activity of the current.

In paralysis of the lower extremeties, even when depending on extravasation on the brain, and the case is one of some standing, we may expect a partial relief, at least from the paralysis arising from the stimulation of the battery upon the spinal nerves: by reflex action, and by increased energy to the muscular currents, we get the muscles themselves brought more under the influence of the will; they also, by means of the battery, acquire a degree of strength and firmness which they had not before, and enables the patient to use them in a manner much more to useful purposes than he had been enabled to do since the beginning of his illness. One of the benefits to be derived by this means, even in the worst cases of paralysis, is, that by this restoration of the muscular power, and its consequent firmness, you prevent one of the worst consequences of the case taking place, that of the wasting of the muscle, or muscles, and a state of inertness of the limbs that will not only prevent all chance of even a partial recovery, but also an increasing feebleness which only terminates in all motion being irrecoverably lost.

To prevent such an unfortunate state of matters taking place (and we are afraid they are of daily occurrence), we have therefore two agents that can be depended on, and bring to our assistance:—we have the spinal axis, and the nerves it transmits to the limb; we have also those slow currents that are at all times circulating in the fleshy parts; both of these can be got at in a direct manner, and supplied time after time, with increased healthful stimulation, and by that means we may expect in all reasonableness a great deal of improvement in the muscular strength and energy of the paralysed limb. The premises are legal, because they are known to exist, and the deductions therefrom made we think are perfectly just and legitimate.

The action of electricity on the muscles and nerves, produces two distinct kinds of contractions; the first which is called idiopathic, is the result of the immediate action of the current on the muscles, and the second, which is named sympathetic, arises from the action of electricity on the nerves, which presides over the motions of the muscles. Now, idiopathic contractions are necessarily produced in whatever direction the current of electricity passes; but the occurrence of sympathetic contractions must be governed by the direction of the passing current; they can only take place when the electricity is transmitted in the direction of the nerves; the shocks then experienced, when the current is transmitted from the shoulder to the hand, are more powerful than those passed in the reverse direction. With all those appliances, and with the utmost care and attention, every one knows who has had the charge of such cases, that they are very troublesome to manage, and without a good deal of patience by all parties, the ultimate cure will still be remote and problematical. In the treatment of paralysis by means of electro-galvanism, it will be well to remember the action of electric currents on the nerves, so lucidly described by Matteucci.* Let it be admitted that the electric, which traverses a nerve in the direction of its length, determines a derangement in the direction of this current; let it be admitted that this derangement is accompanied by vibratory movements of the nervous fluid, which are probagated to the extremity of the nerve, parallel to the direction of the organic derangement. Paralysis of the voluntary nerves, is marked by loss of voluntary motion over the muscles; we may therefore in safety look through those bodies to the nervous distribution, for a cause in the various descriptions of paralysis. The question of first importance is, whether this paralysis is within, or without the cranium. In the former number of cases very few can be cured by any given remedy whatever; in the latter, a great many can either be entirely cured, or at least their condition very much improved by the steady, continued, judicious application of electro-galvanism. Paralysis of the lower half of the body, or of one or both of the lower extremities is a disease of the most serious description. In its recent simple uncombined form, it seems to have its origin in some functional alteration of that portion of the spinal nerves which supply the pelvis, and lower extremities with motion and sensation, and to these we have to apply ourselves for the cure. It would be ridiculous to expect that galvanism can at once restore motion and sensation to an entire limb, for those who so expect it, will only be sadly disappointed; this can be easily exemplified in the phenomena exhibited during those attempts—no pain, nor feeling of any kind can be got by galvanism out of a paralysed limb. If, however, the positive pole is placed over the lumber vertebræ, and where the parts are ***entirely sensible***, and the negative a few inches down the paralysed muscles, then if the battery is a proper one, and applied in the above manner, and if we give it a proper trial, we may expect to be able to restore by piecemeal, motion and sensation to the weakened limb. In the manner indicated will the whole member be brought gradually to receive a continuous stream of nervous power from the ***root*** of the ***nerve***, implicated through its most distant and minute ramifications; all this, however, will not be easily attained without skill, assiduity, and attention.

---

* Noad's Electricity, p. 461.

In some forms of this complaint occurring in old people, and evidently arising from sheer nervous debility, with a corresponding weakened action of the heart, and where there is no acute organic mischief going on in the brain, such cases will, in the majority of them, receive much benefit from the restorative powers of galvanism; the feeble pulse, and the weakened nerve, will alike receive support from the restorative. We are in the habit of applying the positive pole to the muchæ and the negative to the feet, and continue it there till that amount of increased strength will be given as will suffice for the time. In this manner will the galvanism be continued day after day, the languid circulation receiving its stimulating properties, and the nervous system becoming more and more invigorated by the daily infusion of this invigorating principle; the extremities will feel firmer, and the patient will be less fatigued by walking than before, and stronger on the limbs. The time it is to be applied at each sitting, and length of time it is to be continued in altogether, will depend on a variety of circumstances, which it will be impossible to indicate or estimate from the beginning. So it is with where it should be applied in each case—no precise place can be fixed on as to suit the circumstances of every individual case; that must be left to the medical attendant who has the charge of the patient, and who is best able to judge. Where there is great irritability it is much better to get the irritation allayed before any other means is taken. In paralysis much may occasionally be done by passing streams from the spinal cord, more especially that part of it interested in supplying the paralysed limb with nervous energy; as well as by increasing the activity of that portion of the electric currents residing in the muscular fibres. Every portion of those muscles more immediately interested, will require to be operated upon individually, so that no portion of a muscle required for the motion of the limb, be left without its full share of electric force. This inducted force can be more especially applied to those muscles that are most deeply implicated. This no doubt will require a good deal of care and discrimination, so that those muscles that are most deeply in the paralysis may have an additional share of the stimulus induced. Day after day, must this system be insisted on before even partial relief may be expected from this, or any other treatment. The currents to be continued from the spinal cord down the paralysed limb, may at all times precede the application of electro-galvanism by frictional induction; by this means the limb is in a more fit state for receiving the impressions produced on the muscular system by the inductive process. Nothing but a steady, well-conducted course of this sort can, or will avail, bearing in mind the character of the disease under treatment, the state of the parts to be operated on, what they required to be restored to a healthy state, and the nature of the agents at our disposal for effecting this purpose. Although the nervous force has no direct influence with the currents existing in the muscles, yet, by passing streams through the course of the wire, these muscles will receive the energising influence by the nervous distribution through the muscle. It will at all times be necessary to transmit a series of streams through the entire nerves distributed over the part, and by that means, in unison with electro-friction, we have every reason to expect a large amount of benefit and relief to the patient. If in the hand or fingers, the passage of the electro current from the neck downward, will be the proper course; and if in the knee, hip, or ankle, let the passage be on the lumber vertreival—the negative to the inner margin of the ankle, continuing it there for half-an-hour, then placing the feet in warm salt and water, and applying the negative to the under surfaces of both; it is now to be continued another half-hour, or till the patient feels a pleasant glow of heat over all the body; it is better not to apply it to the feet till the pulse has indicated some greater degree of firmness; if it does not do so, then it will be better to allow streams to pass through the heart, to put the positive in the left hand, and the negative in the transverse direction when taken in relation to each other. Where the weakness, or the paralysis extend over the whole limb, it would be well to recollect the situation of those currents, for it is upon these we have more immediately to act, as well as upon the nervous distribution; and being one of the important agents that we have to pour in our stimulation upon, their relative influence in the cure of the complaint is well deserving of our attention—for it is by calling in to our assistance every agent interested in the matter, that we can accomplish all that is required.

We remember a case coming under our care of a female aged 41, recently confined with her first child; the labour had been very tedious and severe; since delivery she has had little or no power over her bladder, rendering her truly miserable. She was at once put under the influence of galvanism for an hour every day, and perseveringly continued in for four weeks, by which time she was considerably better, and could retain the urine for at least an hour at a time, which, considering her previously miserable state, was a great blessing to her. The application was continued for another four weeks, by which time she could retain the urine nearly three hours; it was therefore laid aside as she felt perfectly recovered: the only medicine given was the sesqui-cholorate of iron.

Case 2. A gentleman of 67 years of age, who enjoyed for many years a situation under government, and so situated as to be unable to leave what he was engaged in at call of nature, so that for some years he was obliged frequently to be in this constrained and most unpleasant situation; the continuance of which ultimately brought on paralysis of the bladder. He was put under the influence of a mild stream from an electro-galvanic battery for three quarters of an hour morning and evening, and ultimately increased to an hour each time; in three weeks he was so much better as to be able to retain the urine for an hour and a half without effort; it was therefore only necessary to apply the remedy every morning for an hour—this was continued for four weeks more, when the bladder had resumed its usual tone. In the cure of paralysis of the bladder much rational dependence may be placed on this remedy. Considering that the disease is one purely of loss of power, either of the nerve supplying the part, or of the muscles of the organ, or both; that the muscles, and nerves of those parts can be directly influenced by the energising power of this great agent of nature, and that too, in a way and manner so entirely like to the healthy action of the parts, it is but reasonable to expect that in the *proper* use of this means, the paralysed organs will have instilled into them that share of this invigorating principle necessary for restoring the healthy functions of life.

The late Mr. Birch, one of the surgeons in St. Thomas's Hospital, in writing to his friend, Mr. Adams, says, "The public have a right to expect from me some account of those experiments in medical electricity, which I have now been engaged in for twelve years, and in which I could have never so invariably persisted, had I not found it in many cases exclusively eminent and efficacious; for if it applied only to such diseases as were curable by other means it would, I am sensible, avail little in practice, but its merits are, that it often affords relief where every other hope is lost, and saves the noble art of surgery from the opprobrium of amputation. It was not till after several years' experience that I formed in my own mind a system arising from its action in diseases of the system. This was the result of continued observation, and has enabled me to teach the practice more scientifically."

Surely the opinion of a person of such high respectability and learning as Mr. Birch was, is worth a great deal, doubly so, after a continued series of experiments extending over twelve years. We shall therefore detail some of the cases as they are related by Mr. Birch himself.

A shopman of Mr. Barattey's, of Fish Street Hill, had been three years afflicted with a coldness, with the total loss of the use of the lower extremities. He had gained no relief from the advice and remedies he had used, and, therefore was sent, for my opinion. Upon examination of the spine, I found no reason to conjecture it depended on any affection of that part; the disease had gradually come on from a chill, after heating himself on a summer's day. He was otherwise well in health; I therefore thought the electric friction or shock might probably be serviceable, and I put them in use. The first week I made powerful frictions, but with no advantage. The following week I used shocks, and increased them from day to day, but the patient was no better; however, he felt no inconvenience from the experiment. I then proposed to him that, for one month he should regularly suffer me to draw the fluid only through the affected limbs; and I had not adhered to this simple experiment more than one week, before evident advantages were perceived. I therefore determined not to alter my plan; and, within the month proposed, he was able to walk with a stick, and, from day to day, gained visible advantage, and in a few weeks established a cure.*

A delicate young woman, aged seventeen, who never menstruated, simply from a deficiency of blood, and also of nervous force, was brought to me, complaining of a sense of heaviness in the head, numbness, with a feeling of coldness, and want of power over the whole of the left side of the body. She could walk slowly, with the leg dragging. She was sick, and felt weak, and complained of the want of heat and feeling in her feet, and extending up the limbs. She had a hot bath for her feet and lower extremities, was put to bed, and had galvanism applied to the various parts of the spinal cord, the heart, and the pneumagastric nerve.

---

* Birch Adams' Electricity, 540.

Allowing the streams down the spine, we had the negative pole to the soles of the feet. When the positive pole was applied to the inner edge of the sterno-mastoid muscle, the negative was applied to the lower edge of the stomach.

By this method the head-heaviness was distinctly relieved; heat and feeling were at length in some measure restored to all the extremities. The same system was continued in for three weeks, to the great improvement of her general health. It was considered a proper time to endeavour to get the presence of menstruation. Streams were passed from the loins through the uterine cavity for ten minutes every day, only, however, after the usual application of galvanism had been finished. In four weeks of this method, menstruation appeared in a moderate quantity; and, as her general health had in a great measure been restored, the application was laid aside, having accomplished all the purposes desired, with very little inconvenience to the patient, and indeed without any pain whatever.

In paralysis produced by the severe efforts sometimes required in reducing dislocated bones, streams of electro-galvanism passed daily in a line with the origin and insertion of the muscle, and continued for not more than half-an-hour each time, the stream being only of a moderate strength, and each application being immediately followed by ten minutes of frictional galvanism, will be found a most efficient means for the cure of this complaint. The treatment generally lasts a few days, less or more, according to the severity and standing of the case; in the aged it takes a longer time to accomplish the desired result.

These facts, which have been confirmed by Matteucci, may safely guide us in the treatment of paralysis by means of electro-galvanism. If the currents are passed from the hand to the shoulder the contractions are much less severe, and the difference is even much greater in cases of paralysis—in fact scarcely at all felt. The articles of dress which we sametimes wear, when they are of the same temperature as the body, are sometimes the cause of electricity passing off from the body, produced by the friction of the body against the clothing: sometimes it is positive, and at other times negative; the human frame, when in health, is in a positive state of electricity; stronger in winter, and weaker in summer; the diminution in the latter season being in all likelihood caused by a portion of the electricity of our bodies passing off with the perspiration.

In the rank of external stimulants we are to arrange Electricity and Voltaism. From the approach these subtle fluids seem to make to the nature of the nervous fluid, and more particularly from their well known, and extraordinary power of re-exciting irritability in the muscular fibres of animals that have been for some time dead, it is very reasonable to suppose that either of these stimulants might be employed with great advantage, and accordingly we meet with them in very extensive and popular use from the earliest periods of their having been, if not discovered, at least reduced to scientific management; and there are numerous reports of cases in which it was tried with advantage rather before the middle of the last century.

The fact seems to be that, even at this late period, we have much to learn upon the subject, so as to discriminate exact modifications of electric power; for that in both forms it has been of high benefit is by no means to be disputed; and even at times, when communicated by the *gymnatus electricus*, or electric eel itself—of which a singular example is given in the "Haarlem Transactions," the patient having recovered the use of the affected side after one hundred strokes from the fish. On the whole, as it is a direct stimulant, it appears better adapted to the atonic than to the entonic characters of paralysis.

There is another class of paralysis sometimes met with in females, termed ***hysterica paraplegia***, having its origin in hysteria. In no kind of paralysis are the benefits arising from the use of electro-galvanism more distinctly evident than in this disease. Indeed, in some cases which we have had, its curative powers were felt immediately. The rapidity with which the invigorating influence was exhibited, could only be accounted for by the circumstance of the patients so influenced being females of high nervous susceptibility; and they were just the kind of people most likely to receive with a degree of avidity the impressions produced by any active agent. In those cases depending only on some constitutional disturbance, the use of the electro-galvanic application will require to be continued in some length of time—the streams to be weak, and not continued longer than half-an-hour at each application.

Almost in every case there is some individual muscle or set of muscles, that require the immediate stimulation of galvanic friction. Frequently they desire to have the friction applied over the heart, and always with the best possible result. In not more than ten or fifteen minutes' use of it, they would exclaim they felt a great deal better. This rapid relief frequently deludes them, so as to make them believe they can do without any further assistance from it. They are very soon undeceived by a rapid return of the complaint. Where the paralysis is complete, and no evidence of the head being interested in the disease, strong streams will require to be passed through the limb or limbs; or, if that cannot be accomplished, we have found the greatest advantage received by placing the sponge (after having dipped it in salt and hot water) from the wire of the positive pole an inch or two above the margin of the insensible part of the dorsal vertebræ, and the one from the negative over the sciatic notch; the application to be continued not less than three hours each time; and, as soon as sensation is distinctly felt, a plate of silver and one of zinc are to be applied, over double cloths wetted in salt and hot water, and fixed on by adhesive plaster, and worn continually. Independently of this mode of appliance, it is well to pass strong streams from the healthy portions of the spinal cord, as far down the paralysed limbs as it can be transmitted and felt, and by this means a line of demarcation will be so clearly made out, that the place necessary for the fixing of the line, will be most evident. When the paralysis is complete, and extending to the bladder, and the rectum, with indications of organic disease of the cord, then we say the case is very desperate; but where the paralysis is incomplete, with none of those indications, there is every prospect of the case being satisfactorily cured, by a complete return of sensation, and the power of locomotion.

Even in those successful cases, however, it is always better to pass a moderately strong stream through the whole limbs for about ten minutes, and repeated twice a week for two or three months. In the interim of these applications, it will much facilitate the return of muscular strength and energy, if the galvanic friction be employed for at least an hour every day.

## PARALYSIS OF THE BLADDER.

There is no disease in which the use of galvanism is indicated, wherein its benefical influences are more decidedly exhibited than in paralysis of the bladder, arising from functional debility, and that weakness having its dependence on some want of nervous force, or in the muscular coats, or possibly in the spinal axis itself. One reason of its being so much under the control of the energising effects of the galvanic fluid is, that the roots of the nerve in fault can be so easily reached, so as to enable the operator to transmit his streams through the nerve from its origin, and over all, or any particular branch of its distribution. To get it applied in this natural manner is giving the remedy an advantage over every other means, be they of whatsoever description they may. Galvanism in all cases of this description, has a decided advantage over every other means. When depending on merely functional debility of the muscular coats, it is almost entirely confined to old people, and more frequently to the male sex. This complaint causes insufferable annoyance and inconvenience to the unfortunate patient, requiring the strictest attention to a rigid form of diet, as well as the quality and quantity of drink. It is even unsafe for them to be out of doors for any length of time without a continued fear hanging over them. When occurring in females it is most generally the product of protracted and difficult labours, or of old age, and sometimes causes the person to suffer the greatest inconveniences. In all these cases we think it best to apply the positive electrode over the sacrum, and the negative over, or into the neck of the bladder, as the urgency of the case requires. If the case is one of severity it will require to be employed not less than an hour, or an hour and a half at each sitting, and to be continued daily. A very convenient way is to take sparks from as near to the neck of the bladder as possible. But under any circumstances, it is most necessary that it be continued in for a proper time, remembering that it is better that the streams be rather mild than otherwise. It will also be found necessary, in some severe cases, to have the application morning and evening.

Paralysis of the bladder, especially in old people, is sometimes of a very intractable character, and requires much attention, as well as great perseverance, otherwise little good may be expected from galvanism. It must be steadily persevered in till the bladder has acquired its healthy tone of action.

Its stimulating effects on the kidneys are shown, in cases of non-secretion of urine particularly in those cases seemingly depending on a deficiency of nervous energy; it is most common in the aged, and in the male sex more than in the female. About eighteen months ago I was consulted in reference to an aged gentleman, who had been occasionally troubled with the non-secretion of his urine. He had tried several remedies with but indifferent success. At this time he had only passed urine once during the previous three days. He complained of a sense of weight, with a feeling of coldness over the whole of the lower half of the lumber, and a portion of the sacral. A sponge being dipped in hot water and salt, and tied to the wire from the positive pole, was placed over those parts; the negative was laid over the inner surface of the thigh; rather strong streams were passed downwards from one of the Grove batteries, and continued for an hour. The feeling of coldness passed off after the first application, and in eight hours he was enabled to pass about five ounces of rather chocolate-looking urine. In ten days the sense of weight in the kidneys had disappeared, and the secretion of urine, though neither healthy in quantity nor in quality, had considerably improved. At the end of the fifth week he expressed himself as being entirely well, and able to pass a sufficient quantity of urine every day, without either pain or difficulty. He therefore left off using the galvanism, feeling, as he said, that he did not require it.

We remember a case coming under our care—that of a middle-aged female, of rather diminutive figure, who was suffering from complete paralysis of the bladder since the period of her confinement, which had taken place about five months previously. The labour had been tedious and severe, for the management of which she had had the services of a very old and ignorant woman. The natural consequence of this, medical men can very well estimate. Since her confinement she had had no power over the bladder in any way whatever, rendering her really miserable. She had taken some medicine, the nature of which we could not learn, but not finding the relief she anticipated and required, very soon laid it aside. She was at once placed under the influence of electro-galvanism; the sponge from the wire of the positive pole being placed over the last lumber, and first sacral vertebræ, the negative being placed down the inner surface of the thigh. The stream to be moderately energetic, and to be continued for half-an-hour each sitting, immediately followed by fifteen minutes' of the galvanic friction from the same battery, to be extended over the whole of the hypogastric region. This system was continued in every day for three weeks; she now felt so much better as to be able to retain her urine sometimes for an hour and a half consecutively. The applications were therefore only deemed necessary every alternate day, otherwise no alteration requisite. In four weeks more she was able to retain the contents of the bladder sometimes for three hours; she was otherwise in excellent health and spirits. The application was gone on with twice a week for two weeks more, when she said that she felt so well, that there was no need of using it any longer. We have frequently seen her since, and find, that, although she has been twice confined in child-bed, since our attendance, there has been no return of the paralysis.

## FACIAL PARALYSIS.

The late Dr. Golding Bird in his published lectures on electricity, narrates several cases of paralysis of the facial nerve where he was most eminently successful in the treatment by means of electro-galvanism. The mode of applying it will very much depend on the circumstances of the case; sometimes relief is found, and a cure accomplished by drawing sparks from the parts affected, or over the principal of the same nerve.

He relates the cases of two young persons who were under his care, suffering most severely from facial paralysis, but who were most effectually cured by means of electro-galvanism.

He also relates the case of an old lady suffering all the torments of facial neuralgia for five years; the pains passed from one branch of the fifth pair of nerves to another, but was ultimately curtailed the fifth day of the treatment: such successful modes of treatment ought to be remembered and if possible imitated.

An old man who had been long under the affliction of hemiplegia, and who, although wealthy, had not the heart to apply to a physician for aid, and had too much pride to ask relief from an hospital, came, recommended, for advice; I insulated him, and put in use powerful electro-frictions, which perfectly cured him within a month.

A gentleman who had been many years an invalid, but who had attained his sixtieth year, being exposed to a bleak wind, was blighted (if I may be allowed the expression) on the opposite side; the muscles on that side of his head and face entirely lost their action, his eyelid dropped, his tongue hung slobbering from his mouth, his face was drawn on one side, his speech affected and his arm and hand benumbed, his leg was but slightly affected; in this situation he advised with Doctor Hugh Smith, who was no inactive practitioner, but during a month he received no benefit; by the Doctor's advice he applied to me. The electric method I put in use was insulation, and electric friction.

Doctor Golding Bird narrates the case of a poor needlewoman, worn out and exhausted, struggling to get a miserable pittance for her livelihood; she had at first felt vague pains in her toes, then in her knees, regularly come on, and at the time he saw her, the lower part of her body was as powerless as marble. In this case, as in other cases of the kind, there were no evidence of organic disease, and by due nourishment, rest in the recumbent position, the use of iron, and tonics, her general health was restored. Electric magnetic currents were then employed daily, and the doctor had the pleasure of seeing this young woman in about three months walk out of the yard quite well. This case is interesting as showing a perfect state of paralysis arising from pure nervous debility, brought on by exhausting circumstances, such as low diet, great anxiety, and long hours of labour, and how that exhausted energy was, and can be restored by galvanism. The muscular currents can be acted upon, in a direct manner, stimulated to greater activity, and supplied with new invigorating principles; nutrition is supported, the muscular tissue becomes firmer and more able for their work; the heart receives its stimulation in the same manner that the other organs of the body does, acquires a new energy, the blood is circulated with a greater amount of healthy vigour, and the whole system feels the force of this healthful stimulation, and yields obedience to the impulses of itself.

## PARAPLEGIA.

Paraplegia is a paralysis of the lower half of the body, or of one or both of the lower extremities. It is a disease at all times of the most serious importance to the unfortunate individual who is so afflicted. In its simple, recent, and uncombined form, unconnected with organic mischief in the spinal cord, but simply a functional derangement of the spinal axis, and of that part of the cord only which supply the inferior extremities with sensation and motion, it becomes one of those complaints that can with all probability of success be left to the energising influence of electro-galvanism.

The following case, occurring in my own practice, and at present under treatment, is of sufficient interest to make it worthy relating so far as its history goes. A master baker, aged 32, and residing in the north side of London, was subject when a lad to severe pain, and weakness over the back, which left him on coming to manhood. He afterwards was considered rather a powerful person, although occasionally troubled with short breathing, unfitting him for living in the more humid atmosphere found in some parts of Devonshire: in the drier atmosphere which we have in the higher, and northerly parts of London, it seldom troubled him. In the spring of the present year, he was seized with severe pain over two of the superior dorsal vertebræ, extending round the body in a line with the diaphragm, and producing a feeling there, as if he was bound with cords, coming on in spasms, and occurring principally during the night, with cough, and difficulty of breathing. There was some difficulty I believe, in arriving at a knowledge of the true character of the complaint; some supposing it to be inflammation of the pleura, others rheumatism, cancer, &c. When called in to take charge of the case, the same symptoms still presented themselves, with the addition of total paralysis from the seat of pain in the dorsal vertebræ, over the entire lower half of the body —sensation was destroyed as well as that of motion. There was still tenderness on pressure, when a sponge, after being dipped in hot water, was passed over it. The spasms round the abdomen were occurring principally during the night (a circumstance characteristic of those depending on spinal paralysis). Blisters and sinapasms were repeatedly applied over the seat of pain, in the spinal column, till the tenderness on pressure was allayed. Galvanism was now had recourse to. The electrode positive being placed a few inches higher than the line of insensibility, and the negative below the line, the stream being at first rather weak, and gradually increased. After a few days' application a feeling of trembling was felt under the sponge, from the negative pole; this trembling was evident to the eye, and was seen extending down the back in two lines, one on each side of the vertebræ; it also extended across and in a line with the diaphragm, precisely the same parts that were constantly the seat of spasms during the night. After a short time the sponge was carried a few inches further down, and continued there till sensation was at least for the time established. It was afterwards placed over the sciatic notch, interesting thereby the sciatic nerve, and following the line of the great trunk nerves. The same conduct was daily followed out; the negative being carried down to the popletael space, and lastly to the toes. After nearly two months' application of the battery in this manner, sensation, as well as motion, has in part been restored to nearly the whole of the spinal column, and when these functions are in full established, there is no fear but the power of locomotion and of sensation will be restored to the limbs; this will not be the case, however, until whatever fluid effused around the parts is re-absorbed, nutrition restored, and the usual tone of the cord, and the nerve, or nerves interested have become re-invigorated. This of course is the work of time, care, and attention; but if successful, and there is now every human probability of it being so, then a fellow-creature will be restored to health and usefulness, who otherwise would have been a most miserable and helpless object, unable to assist himself, so far at least as the entire lower half of his body is concerned, in any way whatever.

In the case of an elderly gentleman, with paraplegia, which came under our care, there was also loss of motion and sensation from the shoulder to the points of the fingers. In the first part of the galvanic process, the whole of the arm was brought into the galvanic current, by connecting the positive with the nuchæ, and the negative in the hand, which for convenience was immersed in salt and water, warm. By this mode of treatment we found that no good was done, nor did the patient experience any sensation whatever, even after some pretty strong currents were applied. Whilst thinking on the cause of this negative result, it seemed that there possibly might be a means of getting sensation and motion restored, by operating only on a small portion of the limb at a time; and in order to ascertain how far this view might be correct, the line of demarcation between the sensitive and the insensitive part of the limb, was ascertained by pinching up the skin about the shoulder, and upper part of the arm; this being done the positive wire was applied to the neck, and the negative a few inches down the insensible part near to the axilla. In half-an-hour's application sensation was perceptible so far down, this removed the line of demarcation. By keeping the positive *in situ*, and removing the negative slowly downward as the stimulus began to be felt, we succeeded in restoring motion and sensation to the whole limb.

Aldini, in his beautiful experiments, and most scientific researches said, while speaking on this subject, " To conduct an energetic fluid to the general seat of all impressions, to distribute its influence to the different parts of the nervous and muscular systems, to combine, to revive, and to command the vital powers, such are the objects of my researches;" and such are the advantages I propose to derive from the action of electricity.

## APHONIA, OR LOSS OF VOICE.

In cases of loss of voice from paralysis of the muscles of the larynx, produced either from cold, over-exertion, derangement of the digestive organs, or fear, or it may be produced by any cause which is likely suddenly to exhaust or depress the nervous system, we have generally found that sparks drawn from the wind-pipe, or streams passed through the muscles of the part implicated, has been of the greatest service. In other cases much good has been received by placing the positive electrode in the neck, and the negative over the cricoid and thyroid cartilages—the patient to be kept about an hour under its influence; two or three sittings generally suffices for the cure. When occurring in patients of weak nervous constitutions it is most desirable that the system generally should also be put under its influence, for at least half-an-hour every alternate day, and continued in till the nervous system has acquired a continuance of healthy tone and energy. The same means will most materially assist the functions of digestion, assimilation, and nutrition, and will be the means of restoring the general health.

In loss of voice, as in spasms of the respiratory muscles, producing a peculiar affection of the movements of respiration, they may lose the power to articulate, with a spasmodic action of the diaphragm. These spasmodic states may exist to some extent constantly, but occasionally increasing in paroxysms of different severity in individual cases: these are usually suspended during sleep; in this they differ from similar affections depending on the true spinal excitor nerves.

In cases of unmixed aphonia, or loss of voice, we are in the habit of applying the sponge from the wire of the positive pole in the nuchæ, and the negative either over the cricoid cartilages, or in the back of the mouth.

Some authors propose placing the sponge from the positive electrode on the tongue, but this being a reversion of the currents of electricity, there is little hope of its being of much use; it will generally be found that if the current is made to traverse the nerve from its origin to its destination, there is much more energy diffused, and only by this method can we get contraction; sensation is only to be got by exciting the reflex action, in placing the positive at the extremities of the nerve, and the negative nearer to its origin.

## APHORIA, OR STERILITY

Is frequently a purely functional complaint, and, as such, comes within the circle of those diseases wherein galvanism can be made subservient to the cure. The defect of inertia in the majority of these cases, is compared by Dr. Marshall Hall, in illustration, "to that condition of the uterus frequently attended with leucorrhœa;" in this point of view, he says, "sterility becomes a legitimate object of medical inquiry, and medical treatment." That form of aphoria termed tonic, and depending in any way upon organic derangement, does not come within the category of those complaints that are at all likely to be benefitted by the use of galvanism, therefore we pass them over.

The condition termed inertia, by whatever means induced, is, then, a state of nervous debility, in this case, of the uterus and its appendages in the female. From the intimate sympathy existing between the uterus and the mammæ, as shown in the pains in the latter organ during uterine derangement, and in the inverse ratio the mammæ influencing the uterus by the uterine pains produced by the suckling of the newborn child at the mother's nipple, we have thus in the female mammæ a valuable assistant, for acting through, in the cure of atonic sterility. These muscular pains are not only rather severe, but somewhat permanent.

Taking advantage of this intimate connection, by sympathy of the uterus and the mammæ, an opportunity occurs immediately before, and after the catamenial period, of applying it at the times when that sympathy is at its maximum, and continuing it for such a time, both before and after those periods, as the necessities of the disease and the condition of the patient will require The same mode of treatment may be followed in asthenic uterine leucorrhœa, streams being passed from the mammæ to the uterus; the positive conductor being gradually carried down the spinal column, then gently brought round to the abdomen, the negative conductor being at the same time passed down to the leg. Such being the case, the functional conditions of the one organ, influences the state of the other. The fact of the uterus contracting from the suckling of the infant at the breast, show an amount of nervous sympathy in action which is worthy of being noticed. By long-continued suckling, we have, in the majority of instances, a comparative state of uterine inertia produced; the same kind of exhaustion can be momentarily produced, by a prolonged application of the stimulus of galvanism; indeed, stimulus of any kind, when continued too long, produces exhaustion corresponding to the previous health and strength of the individual, and the extremes that the stimulus may have been carried to, in the same parts, through the sympathy of another organ, such as the mammæ is to the uterine cavity; or the stimulus can be applied directly over the seat of that organ, by means of galvanic friction, or even sparks can be drawn from the same parts. By these various means of application, galvanism in this way has a decided advantage over every other stimulant. It will at all times be proper to begin each application of the galvanism by its application to that portion of the spine which supply the uterus with nerves, and having these in some measure stimulated, they will be in a fitter state to receive the impressions produced by its reflex action through another organ.

As all spasmodic affections, as well as some paralytic ones, are supposed to have their origin on the true spinal, or excito-motory system, "I believe that the whole order of spasmodic and convulsive diseases belong to this division of the nervous system."* According to these views the parts usually most interested in spasmodic diseases of almost every description, are those most intimately connected with the functions of ingestion and egestion, such as the larynx in spasmodic croup in children, in epilepsy, chorea, hysteria, and many others; in all of these named, the respiratory muscles are more or less affected. If this comprehensive view of the origin of all those diseases be correct, then there is a nearer approach to unity of origin and character, and a corresponding simplicity in the treatment.

## SPINAL IRRITATION.

The following rather abstruse case, which occurred in the person of a lady, the wife of a medical friend, is both highly interesting, and to the purpose we have in view, showing how galvanism will, in cases of a purely functional nature, as in a disturbance of a nerve or nerves, producing diseases of a most agonising description, relieve those spasmodic actions, by giving a healthful, nature-like stimulus to the nerve, and restoring its proper tone and vigour of action, in such a direct and efficient manner, as no other stimulant that the science of medicine can in any way indicate. The patient was about fifty-five years of age, of delicate make, but healthful till the time of this attack, active, and of highly temperate habits. After a journey of upwards of 400 miles, and afterwards enduring a great deal of fatigue while on a visit to London, she was seized with a violent pain in the right lumbar region, and extending all round that side of the abdomen. There was no pain on pressure, but rather gave, if anything, slight relief, and the pulse was not in any way affected, showing thereby the absence of all inflammatory action. Nothing could be detected wrong as to the state of the stomach, bowels, liver, or kidneys. The pains came on at short intervals, and to all appearance were wearing out her strength very speedily. I have not been able to ascertain whether the state of the spinal axis was specially examined into; but from what I know of my medical friend's high intelligence, skill, and care, there is no fear that this special inquiry would in any way be overlooked. Cathartics, with the use of the grey powder, and other more or less active medicines, were continued in for months; leeches, blisters, fomentations, frictions with various kinds of linaments, embrocations, &c., with the occasional use of opiates for nearly as many months more, but none of which seemed to do her any good. Many of his medical friends, and some of them gentlemen of high standing, were consulted, and although their suggestions were carried out to the letter, yet she seemed not to receive the least benefit. After a time, a course of tonics and bitters, which relieved the debility a little, was had recourse to, but otherwise did the disease no good. It was then deemed advisable from the great prostration the patient was suffering, to try the stimulating influence of small quantities of brandy and cold water, to be given more especially on the accession of pain. This seemed to give more relief than any other remedy she had yet tried, and evidently arrested the progress of debility, and for the time supplied the place of food, for during the previous twelve months of exquisite suffering, she had not been able to eat more than what would be necessary to support a child of two years of age; taking these things into consideration, her debility must have been great indeed.

---

* Doctor Marshall on the "Diseases of the Nervous System," p. 244.

Reasoning, therefore, on the relief afforded to the system generally, as well as to the nerves in particular, by the stimulating influence of the brandy, that the case was one in which the more natural stimulant of galvanism could give relief, it was agreed to give it a fair trial. The treatment was begun, *di novo*, by passing streams from the positive electrode of rather a weak electro-galvanic machine, down the affected side, along the spine, and afterward over the entire abdominal surface, and which was continued in every morning for forty minutes; this was gone on with, giving daily the best possible relief, for six months; when she was enabled to lay aside the remedy, having attained a better state of health than any of her friends ever expected to see; since that period (a year and a half since) she has continued to enjoy the most perfect health, feeling nothing more of her old enemy.

There are some points of this case that are worthy of notice; first, in regard to the precision with which galvanism is made to bear on any particular nerve, or nerves, or their branches, or even on a precise spot of the spinal axis itself; we have also the similarity of nature, influence, and action on the parts, or organs to be acted upon, and the agent acting on these organs. In this case, the benefits instantaneously derived from this very similarity, was most striking to every relation around, and astonishingly delightful to the patient herself.

Here was a case under the careful and hourly supervision of a highly talented and affectionate husband and a medical man, assisted by the frequent advice of a large circle of his medical brethren, and where many of the leading medicinal agents got a fair and precise trial, and all failed—simply, I think, from the mere fact, that none of these agents contained within themselves, nor had they the power of exciting it in others, that nervous fluid, or substitute, for the renovation of the enfeebled and irritable spinal nerves, and probably spinal axis itself. From the commencement of the use of galvanism, every other remedy was laid aside, being very glad to have an opportunity of doing so. Her general health received such a beneficial impetus from its use, that her appetite very soon recovered its usual tone, and stimulants of no other kind were at all necessary, except the small drop of brandy once a day. The streams of galvanism applied were so very mild, that they were not at all disagreeable, but rather otherwise; indeed, the patient felt so much relief from each application, that she wearied till the time came round that she was to have its repetition. It was a luxury, as it were, to her, and one that she enjoyed much. It was also a great relief, and to her, a wonderful improvement on the twelve months' swallowing of nauseous medicines of nearly every description.

## SPASMODIC ASTHMA.

I am indebted for the following case to the kindness of a brother, Mr. Thomas Smellie, late surgeon in Glasgow, who states in a letter to me: "I will give you a short account of a case of spasmodic asthma, that came under my care. A gentleman who had been for many years in a tropical country, and from the time of his return home had been the constant victim of this horrid disease, and had undergone every possible kind of treatment, and with very little benefit. After examining the chest carefully, and finding the heart and lungs pretty *free* from any serious fault, and having seen him while suffering under some of the fits, and certainly they were the most severe I ever saw—the feeling of strangulation being such as to cause the most serious alarm, not knowing but the next might be destructive of life. I suggested a careful trial of galvanism, to which he most willingly gave his consent; I began by placing the positive electrode over the superior cervical vertebræ, and carrying it slowly down to the middle of the dorsal vertebræ, so slowly, as to occupy half-an-hour; the negative was placed in the left hand during the entire time; this was continued in for the same length of time every day, during the first week; afterwards it was increased to forty minutes at each daily sitting, and always with great and immediate benefit—relieving him in a very few minutes from a state of the utmost distress, bordering on dissolution, to that of great ease in breathing, and in coughing, and indeed, as he used to express it, of very great comfort. He was so delighted in having at last found a remedy, from which he *could* at all times find *immediate* relief, that he begged I would teach him the proper manner of applying it, as he was resolved to purchase a battery under my inspection, so that he might be able at all times, in cases of emergency, to apply it at the beginning of the attack. Being a gentleman of highly cultivated mind, he was soon able to use it, under ordinary circumstances in his own case, so as to arrest with promptitude, attacks that might occur during the night, or when not within reach of some medical man, properly versant with the application of the instrument. By this means he has been able to attain such a degree of excellent health, and to sustain himself in that state, that he had not been in the enjoyment of for many years. Another great benefit he has received from the use of galvanism is, the fact of being relieved from a state of constant fear of some day soon, being suddenly suffocated, to that of perfect confidence in the remedy, and latterly in his own ability to apply it in his own case, in a proper and efficient manner; the pleasure and benefit derived thereby has had a most beneficial influence upon his general health; and this, in turn, is one of the means to be depended on for the ultimate recovery from this very serious disease."

## CRAMPS.

Are a class of spasmodic complaints that are sometimes exceedingly painful and troublesome; the aged being more subject to them than others; people who suffer from varicose veins have them frequently in the lower extremities; those also whose occupation require them too much in the erect position; the practice of wearing tight garters under the knee also predisposes to cramps in those parts; and wet feet will produce them in the abdomen in others. I am in the habit of applying the electrode (positive) to that portion of the spinal column which gives the nervous supply to the part, and the negative to the feet, while they are placed in hot water; galvanic friction is also used, either of which very soon relieves the patient. A young woman aged 31, was, while rather poorly, obliged to be out of doors in a very cold night of the month of February, 1856; on getting home late in the evening with her feet wet, she was seized with the most violent spasms, extending over the whole of the abdomen, and which made her scream violently; there were alternate rigors, with flushings of heat; her feet and limbs up to the knees, were put into a hot bath with mustard in it; she was then put under the influence of galvanism, the positive electrode to the lumber-vertebrae, and the negative placed under the umbilicus; the stream was just as strong as not to be offensive; this was continued in for half-an-hour; the feet were then placed in hot salt water, and the negative placed under the soles of the feet, and the use of the battery continued in for twenty minutes longer; she then expressed herself as being very much relieved and was put to bed; she slept well during the night, and was entirely free from pain in the morning, but complained of feeling sore over all the body, and was languid; the battery was again applied, the positive pole in the left hand, the negative in the right, and was kept under its influence forty minutes, by that time the feeling of pain and languor had all nearly passed off, and she otherwise felt comparatively well.

In reference to what we advanced regarding the similarity existing between the nervous influence, and the galvanic fluid, and also the peculiar power and influence the pneumagastric nerve has over the organs of digestion and egestion, and that this fluid when made to pass along this nerve, and its ramifications, is made to act with more beneficial energy —keeping those truths in remembrance, it is found that in cramps of the stomach, or bowels, in any way depending on the presence of indigestible matter, galvanism is the remedy at once indicated, and one which we can apply at once, so that its influence is in a moment felt, and one also that we can with confidence rest our hopes on, as being certain in giving relief. This confidence is based on the nature of the disease, and the peculiar influence of the remedy, suited completely to the exigencies of the case. We have found it best to apply a strong current; the sponge from the wire of the positive electrode, to the eight pair of nerves, the negative to the lower margin of the stomach. During its action it is better to give some warm dilutents. Occasionally, in other forms of this complaint, it also may be found necessary, and beneficial, to apply the positive in such a position in the neck as to intersect the pneuma-gastric.

## HYSTERICS.

The electric fluid can be made to exercise a most powerful influence in spasmodic affections, such as in hysterical complaints common in the female constitution. The following cases will very well illustrate its efficiency in this complaint. Hysterics: Mrs. H., aged 39, of nervous temperament, and mother of a large family. Her husband, being unsteady, she was under the necessity of living almost entirely upon tea, since which time she had been sadly troubled with hysterical fits, coming on, after the least excitement, till, in fact, she became quite unfit to attend to the ordinary duties of her family. She was requested to give over using tea, and to have the battery applied to the neck and diaphragm for an hour every day. In three weeks she had only two attacks, an infrequency she had not enjoyed for nearly eighteen months. The same routine was gone on with for five weeks more, when she had only one fit during the preceding week, and that much weaker, and of shorter duration, than any she previously had. It was now considered that if applied every alternate day it would suffice, as her general health and spirits had very much improved. In eight weeks from the commencement, the fits had entirely left her, and she felt in every way perfectly recovered; the galvanism was laid aside, and she promised to return to it again, if they ever troubled her more; but such was not the case, for she has remained entirely free of them ever since.

## NERVOUS DISEASES.

In cases of nervous headaches in females which have a reference to some suppressed or irregular state of the catamenia, we are in the habit of using streams of electro galvanism, applying the positive electrode to the lumber vertebræ, and the negative over the region of the uterus; the streams not to be offensively strong, but continued in for an hour. In some cases the application has to be used morning and evening, and always with more or less of good effect. It will generally be found that in a few applications the catamenia appears, and with it a relief from the distressing nervousness and headaches. In galvanism we have a specific at all times safe to employ, and certain in its action, for the restoration of the monthly evacuations in the female.

We all know that contraction of the minutest extremeties of the arterial and venous systems, is easily brought on by exposure to cold, and damp air, that these contractions produce pain, sometimes paralysis, inflammation, and it may be effusion. The first of these is felt in the amputated limb, the other effects are painfully evident in neuralgia, and in the various rheumatic affections. Admitting as we do that electricity and its modifications are great energising agents, if in a greater or less degree any of those vitalities are withdrawn, organic life suffers in a corresponding degree.

The facial nerve from its peculiar exposed position, is exceedingly liable to receive the paralysing influences of cold and damp air, producing some extremely painful, as well as troublesome complaints; it may appear in the ordinary form of faceache, or it may assume a rheumatic character, or as tic-doloreux; the latter occurring in paroxysms, which are sudden and irregular in their occurrence, and more or less transitory. Acute inflammation of a nerve is confessedly of rare occurrence; now to employ galvanism in this inflammatory state would be highly improper.

Paralysis of the fifth pair of nerves, producing loss of sensibility of a portion of the face, and paralysis of the muscles supplying those parts, may arise either from disease within or without the cranium. In the former case, it is an organic disease, and of a nature which does not properly come within the category of those complaints that we think accessible to the treatment by galvanism. In the latter case, we have the researches and experiences of the late Sir Charles Bell, Mr. Shaw, and Sig. Bellinger to guide us, and in these we find it frequently, as purely a functional disorder; and the paralysis so produced, as well as the loss of sensation, is not so complete as in the generality of cases depending on organic derangement within the cranium.

Where there is any acute inflammation existing in the adjoining surfaces, it would also be injudicious to employ electro-galvanism in any of its modifiations whatever; when the inflammation has entirely subsided, and effusion, or thickening of the parts connected with the paralysed nerve, has taken place, then the application of frictional galvanism, with the drawing of sparks occasionally from the paralysed part, will be found of great advantage, bearing in mind that it must not at any given time, be continued too long, otherwise the nerve may suffer from over stimulation.

Galvanism is singularly applicable in spasmodic affections, particularly in hysteric attacks, that are both so frequent, and so troublesome in the female constitution. If applied during the fit, we have always found that its immediate influence is exhibited by the severity of the fit being reduced, and its duration evidently lessened in a material degree; if applied after the fit has passed off, then its influence will be to restore tone to the nervous system, and greater tranquillity to the patient.

This in part arises from the feeling of strength and energy they enjoy after each application. This is highly necessary and beneficial, as it allows time for the remedy to be employed, so long, as to afford every opportunity of relieving the unfortunate patient. A highly interesting case of uterine irritation is related in the *Lancet*, of March 6th, 1856, by Doctor Mackenzie, showing in a most decided manner the benefits of long-continued mild, and well-directed currents.

In thirty-seven cases of this disease treated by the late Doctor Golding-Bird, by means of galvanism, thirty were completely cured, five were relieved, and two refused to continue the treatment, and died from diseased spine. We have here an example of the impatience of some people in the use of this remedy; if they do not get well with a few applications, they come to the very erroneous conclusion that it is of no use so far as they are concerned; it is therefore laid aside in ignorance; and in place of putting the blame on their own impatience, they scruple not to blame the remedy.

That this is but a fair and impartial statement of the beneficial results from the *scientific* use of galvanism, no one who knew that highly honourable man, can for one moment suppose, but this is a true picture of the benefits arising from the proper use of this valuable remedy. We only say for ourselves, that it is entirely borne out by the results that have come under our notice, extending over a good many years. Whatever exciting causes may be detected, must in the first place, if possible, be removed.

Galvanic needles give the greatest benefit in many cases, while in others it is found to answer best by passing streams along the course of the nerve, as far as that is possible, and continued in for such a length of time, and in such strength, as will suit the merits of each individual case. The same means may be applied for that kind of toothache more particularly, which is not precisely confined to one tooth, but extending over the greater number on that side of the mouth. In *recent* toothache when confined to one tooth, and no precise form of inflammation existing, it is an excellent remedy, and one which can, under these restrictions, be used with safety and with benefit. Electro-galvanism is peculiarly well suited to relieve those various forms of nervous disturbances, more especially in females; this may arise from their greater susceptibility.

Doctor Stacquer relates the case of a lady who had been suffering from several forms of nervous disease, which had existed for several years, and had puzzled her physician; she was fearful of noises, not those she at the moment heard, but those she rather dreaded to hear. She was cured by means of electricity in eight days. Doctor S. held that it was always better to employ this remedy at a distance from the pathological nervous excitement. In the present day we generally find it better, to apply it as near as possible to the root of the nerve implicated, or supplying the part, or parts in fault, and making it traverse the course of that nerve.

In cases of paralysis of the muscles of the various parts of the face, with convulsions, frequently extending to the shoulder of the same side, which cases in ordinary circumstances are very intractable, but with the use of galvanism, are made to yield occasionally in a few applications.

When the inflammation has subsided, leaving depositions pressing on the nerve, and causing pain, or paralysis, as the case may be, then galvanism will be highly serviceable, if carefully applied, in procuring absorption of the matter, and restoring tone to the weakened nerve. To show the obstinacy and variety of these complaints, there are few medicines in our pharmacopeia that have not in some individual case or another, been warranted as a specific, but nearly all have vanished like thin air, under the unsparing hand of rigid experience. If we are to believe with Du Bois Raymond, that the electric phenomena of motor and sentient nerves are incidental—both classes of nerves transmitting irritation in both directions—then if any part of a nerve is submitted to the action of a permanent current, the nerve in its whole extent suddenly undergoes a *material* change in its internal constitution. Magendi was much in the habit of using electricity in the above complaints, and with distinguished success.

In cases of paralysis of a nerve, or branch of a nerve, or muscle, it is better to employ frictional electricity: let the operator form part of the voltaic circle, and with the disengaged hand rub the part affected in a line with the current of the nerve, and continue it gently for fifteen to twenty minutes each sitting.

The same mode of application is preferable in weakness of the muscles; and in the ligaments where you have weakened joints, the patient will be able to bear the application a longer time than in nervous paralysis. The benefits to be derived from this mode of treatment in weak joints, is, simply that, in every case of weak joints we have relaxation of the parts, with a diminution of the heat and energy, caused no doubt by some remote agent or agents acting in the depreciation of the nervous influence. Whatever medical treatment may be considered necessary, we shall confine ourselves to the influences of galvanism, as being that portion only of the treatment that we intend speaking of.

## WEAK JOINTS.

In the majority of patients suffering from weakness of the joints, it will be well to begin the galvanic treatment, by applying it to the system generally; by this means we get the nervous system, and the circulation brought into a more energetic condition; the functions of digestion and respiration also will be benefitted by the stimulation. Nutrition will be promoted, and a higher standard of the general health will in the first place be attained: the patient will therefore be in a much better condition for receiving the energising impressions arising from the local treatment, than he otherwise would be, and that treatment will in turn, have a much more beneficial influence in effecting a cure, than it otherwise would, had not this preliminary treatment been pursued. The local treatment consists in passing streams through the principal nervous cords, from above, downward, followed each time by frictional electricity, having special reference to the line of muscles interested, and to those muscles in particular, which are more deeply implicated than the others; the same attention will be required in regard to the ligaments. In addition to these means, we have found that by occasionally drawing sparks from individual points of the joints, more especially those parts of them which require a larger amount of stimulation, the recovery of the parts is much facilitated. This mode of treatment will require to be continued daily for half-an-hour, and in some instances for an hour; in other cases every alternate day will suffice for its application, taking special care that the intensity of the current is of the very lowest.

Experiments show, that to excite a nerve either to contraction, or sensation, it is necessary that the electric fluid should traverse it in the direction of its length, and that it be not over stimulated to exhaustion by having it too long applied. For rousing the dormant irritability of a nerve, or the contractility of the muscles, it is necessary that the positive be applied to the nerve, or its root, and the negative to the muscle, or muscles. It is necessary that this be attended to in all operations of this description. It was a very true observation of Volta, that the feelings from a galvanic stream or current are more acutely felt on those sensible parts of the body, included in the circuit, which are on the negative side of the pole, except when the electrode positive is applied above a paralysed portion of the spinal axis ; the same has been, with regard to the pungency of the common elecric spark. It will be found necessary to continue' the galvanic friction, and occasionally the taking sparks from the weaker, or more relaxed parts of the joint. In the using of this kind of friction, it will be at all times necessary, that it should be distinctly applied to individual muscles with their tendons, so that those muscles, tendons, or ligaments, that are more deeply implicated in the debility than the other parts are, shall receive a larger amount of the stimulation than the more healthy structures. It is impossible to lay down any rule as to how long it ought to be used in all ordinary cases, because each case will require to be cured entirely on its own merits; yet it would be proper to continue it, till the patient could walk an ordinary distance without pain, and be able to repeat, within twenty-four hours, without the joints suffering fatigue thereby.

In the treatment of weak joints by means of electro-galvanism, we have every advantage in using a remedy, that is at once active, immediately direct, and which will at least supply one of the deficiencies which may be a cause, or a consequence. The nervous force supplying the joints can be rendered more energetic by this healthful stimulation, and the muscular currents, as well as those in the ligamental substance, can also be increased in power and activity. The coats of the blood-vessels, with their circulating fluid, will in the same manner accept of the infusion of this energizing agent. The entire structures of the joint will alike be acted on, and receive the same amount of electric stimulation. It is not difficult to understand what will be the result of a steady-continued application of this invigorating treatment; and it would be unreasonable to doubt but that the whole structure of the joint will be restored to health and activity. Doubtless much care and attention will be required for the accomplishing so desirable a result.

This mode of practice promises success from the fact, that at least one of the purposes for which electricity is so freely developed in the human body, especially that existing in the muscular fibres, is for the purpose of exciting in the nervous cords, the nervous force or influence; and may not this nervous force, in turn, excite the contractions of a muscle without being in contact with its fibres? and is it not as probable, that this nervous power may again induce electricity, just as magnetism in motion will excite electricity?

We have also the secretions in those joints to be remembered and attended to, and if of a morbic nature, their absorption will be accelerated by the stimulating influence of galvanism, whether by passing shocks through the joint, by electric friction, or by the needles in connection with the battery. The channels through which the several structures support themselves, are, the nervous system, the circulation, and the muscular currents; therefore it must be through these means that we can accomplish a cure. The diet and regimen of the individual is made to bear specially on those systems; on that account these must be carefully looked after, and so also will it be in reference to whatever medicines (if any) be required. In the increased activity of the circulation, as well as the improvement in the quality and quantity of the blood circulating, we may expect, from the stimulation of the galvanism to the system generally, while it is made more specially to have reference to weak joints.

In weak joints, whether arising from constitutional debility, from the debilitating influences of gout or rheumatic affections, it will be found that the careful and long-continued use of weak streams of electro-galvanism is of the utmost service in restoring tone and firmness to the muscles and ligaments of the parts affected. The general feeling after each application is that of increased comfort, a freedom from pain, and a greater ability to use the limb, than before the operation. In cases arising from constitutional defects, which will require the exhibition of medicine, the application of galvanism will in no manner whatever interfere with.

The exciting cause in these cases points to the remedy. There is no doubt but those achings arise from the too sudden, and too great abstraction of animal heat, and paralysing thereby the nervous fibrillæ supplying the injured parts. Where the complaint, however, has been allowed to pass on to an inflammatory condition, then galvanism would be highly improper, more especially while in the acute or sub-acute state. Take another instance in what is called sprained muscles, or ligaments, brought on doubtless from over fatigue, or some accident, or by too long standing in some confined position, or from having walked too far, or such like. Every one knows the benefit occasionally derived from rubbing these sprains, and certainly, there is no lack of boasted embrocations, rubifacients, lotions, &c., recommended for these complaints, where, in truth, the gentle rubbing with a little flour, or such like, would do as well as any of them. And how does the rubbing operate otherwise than by exciting the nervous energies of the parts, and rousing them to a more healthy state of action, and thus soothing the pain, and in no other way is it likely to do any good.

## SPRAINS.

Let it be clearly understood that, during the inflammatory stages, it is not only not desirable to employ electro-galvanism, but in some cases it may even be mischievous. It is only in those conditions of absolute debility in the muscular tissues, tendons, and ligaments of the joint, combined with an absence of nervous energy, that this remedy can legitimately be employed; and when used with care, and discrimination, it will be found, in a great majority of cases of this description, to be an agent on which every reasonable reliance can be placed. The illegitimate use of this, or any other curative means, can only end in failure, and sometimes something more even than bitter disappointment.

Sarah W., aged 19, a servant, had sprained her ankle-joint, twelve months before she came under my care. The ligaments of the joint were so weakened that she was not able to walk even the shortest distance without a great deal of pain; the joint was swollen and stiff, but in no way discoloured. She had tried various nostrums in the way of rubifacients, but all of which, although receiving partial relief therefrom, were insufficient to effect a cure. Strong streams were passed through the joint for fifteen minutes every day, followed by the galvanic friction for ten minutes longer; in eight applications she had received great relief from the pain, and was able to walk much better; there was still a good deal of swelling, and some of the stiffness remaining. The galvanism was steadily continued in for four weeks more, when the swelling and stiffness had entirely disappeared, and she was now able to walk a couple of miles at a time without the joint feeling either fatigued, or in any pain. The remedy was now laid aside, it being no longer required. In two years and a half afterwards she called, when I learned that the joint had remained in the same state of strength it was in when she left off having it galvanised.

A young woman under the care of the late Mr. Else, had been recently blistered, and leeched for sprained wrist-joint, in consequence of which she had no use of her hand. She had been ten months under Mr. Else's treatment, with little or no relief. A weak shock was passed through the joint every day, and in fourteen days she was able to present a pitcher in the weak hand to Mr. Else. In six weeks the hand was strong and useful, and free from pain; some little enlargement and stiffness remained, which yielded to the shocks in three days.*

Galvanic friction, or when applied along the course of the nerves, in streams, is a much more reasonable mode of treating either weak or sprained joints, and more in accordance with the advanced knowledge of the present day, than the use of embrocations, linaments, and a host of such like applications, that are more worthy of the darker ages, than the time we live in. In the former we are employing, in the cure of the diseases of our bodies, a great and energising agent in nature, one that at all times and places, of our existence, bears a most important part in the grand constituency of organized life, one which at all times and seasons enters into every pore and vessel of our system, and to live without would be impossible.

We find that this fluid pervades every part of our bodies; every muscle is affected by its influence; every nerve, with its numerous ramifications, is traversed by it; and every inspiration we make, we take into our bodies less or more of its influence. In those diseases which take their rise in this deficiency, or altered condition.of the fluid in the surrounding atmosphere, it is not unreasonable to expect, that by remedying this deficiency, and correcting the altered condition of this fluid in the system, we should find relief from the pains and penalties incurred thereby.

* Birch Adam's Electricity, p. 544.

## PARALYSIS FROM APOPLEXY.

Galvanism can only be useful in this disease where it has its origin, or a dependence on a deficiency of nervous force, such as we find in old people, and where the use of the various stimulants have so frequently to be resorted to. Where there is a deficiency of the sanguine fluid, there is a corresponding want of that nervous influence necessary for maintaining the tone and equilibrium of the whole body. A very feeble action of the heart, by putting an arrest on the circulation through the brain, produces syncope, which differs but little in this case from apoplexy. This will account for the deep sleep and coma which often is the result in these states. When we have a pale face, and a feeble pulse during the fit, we may safely employ galvanism, and do good by its stimulation.

The mere fact of a small clot of blood being deposited on the brain, will not of itself account, by its pressure, for the paralysis which ensues; because those who go down in diving bells, suffer a pressure of fifteen pounds to each square inch of their bodies, and yet suffer no pain: those again who ascend great heights have the pressure on the brain very greatly diminished, and still feel no evil consequences therefrom. We must therefore look to other causes as assistants in producing, and keeping up this most formidable complaint. One of these, and that one likely the most interested is the nervous system, and upon that system must our remedy (Galvanism) be made to operate. By so doing, we are strengthening the forces that sustain life, for in their deficiencies we have the proximate cause of the disease. In aged people who are threatened with this complaint, and who are suffering from these debilitating causes, galvanism is a remedy of the greatest value. The functions of life are at this stage at their lowest ebb, and require a natural stimulus—something that will rouse them into healthy activity, and sustain them in that state. Galvanism is a great natural stimulant, but, unlike most other stimulants, there is not the same exhaustion ensuing even from its too long continuance.

From the nature of the disease, as well as from the class of patients in whom this complaint is met with, it is evident that, to produce all the permanent good expected, from the use of the galvanic remedy, it will require to be continued in for such a length of time, as will afford the opportunity of some material changes taking place in the body; every one knows that with the aged this is not to be accomplished but by slow degrees, the patient; as well as the surgeon, will require to have much perseverance, and not to be too sanguine.

Where there are no traces of inflammatory action existing in the brain, but deposition of some standing, not recent, galvanism does much good, so far at least as the inferior extremities are concerned. That portion of static electricity existing in the muscles will be reinvigorated; and by acting on the spinal nerves, we can, with a little skill, produce a good deal by reflex action. By these means, and with care, and the proper application of the battery, much benefit will be derived. There is no earthly probability that the depositions will become entirely absorbed, but the nervous and muscular systems generally will become less or more invigorated, and their torpidity correspondingly destroyed. Some experienced writers affirm, that even in these cases, the vessels of the brain may be so stimulated by the continued use of galvanism, as either to get the clot that is deposited in the brain absorbed altogether, or at least a partial disintegration of its particles attained, thereby rendering its pressure less mischievous, and the paralysis less severe and troublesome, and in the brain in particular.

When in any way depending on a suppressed menstrual discharge, it will receive the stimulating influences with most beneficial effect, when applied by strong streams passing through the body of the uterus. It can also be used with benefit during the fit, in being directed from the spinal axis to the heart, and also to the diaphragm; when re-action is established, it ought on no account to be applied to those parts, but rather for the return of the uterine flow.

The frequency with which this remedy will require to be used in each individual case, it is impossible for any one to determine without a perfect acquaintance with the history of the case, and a knowledge of how far galvanism has exercised a control, over the symptoms and circumstances of the sufferer. No two cases can in justice or propriety be treated in all their detail precisely in a similar manner.

## RHEUMATISM

Is peculiarly distinguished by the pains alternating with atmospherical changes, rendering the individual so afflicted, a constitutional barometer. The easterly winds by their dryness, coldness, and absence of electric force, seem to be highly inimicable to this disease, as well as in some measure to indicate the remedy. No one is a better judge of a coming change of weather than the patient suffering from rheumatism. It is remarkable that winds blowing from certain points of the compass, should invariably produce specific effects on the animal economy: during these winds, vegetables are frequently blighted. Some philosophers assume that these phenomena seem to indicate, that winds blowing in the opposite direction to the diurnal motion of the earth, have their electrolising power so intense, as to induce their constituents to combine with the exhalations from the earth's surface, and forming chemical compounds, possessing reducing qualities, act upon the vulnerable surfaces of animal and vegetable bodies in accordance with their nature and condition. The functions of the skin and the stomach depend so much upon one another, that whatever produces an affection of the one, has a corresponding influence on the other; considering also that there is constant latent currents passing from the skin to the stomach, and *vise versa,* this union of sympathy and action, can be very well understood and appreciated.

Froriep, in his excellent work on the treatment of rheumatism and other diseases by means of electro-galvanism, relates some most interesting cases that he cured under this mode of treatment. The precision and simplicity of the management, excellently corresponds with the utmost certainty of the results. It is proper to remark that in the majority of cases under professor Froriep's care, were those that had put every other form of remedy at defiance. These cases, therefore, may really be considered as very obstinate, and even desperate ones, still, all of them yielded kindly to the influence of electro-galvanism. I shall simply extract one case as taken from Dr. Lawrence's most excellent translation of Froriep's work.

Case 63. Mr. L., 33 years of age, had enjoyed excellent health; he told me that formerly he had a florid complexion, but from the constant pain and want of sleep he had become thin and pallid. In October, 1846, he caught a severe cold, since which he suffered without intermission from sciatica of the right side. He took medicine for a month with some benefit: shamonum and other remedies were inert: Dr. Schoenline advised him to take spirits of turpentine, which removed the pains on the hip, but he was then seized with vertigo, which yielded to vapour baths, when the pain in the hip returned, and had ever since been continuous, and had increased on walking slowly, or standing. It was very severe in rising from a sitting posture, and he suffered from exacerbations during the night, each lasting from one and two hours, and increasing in stormy weather. In consequence of nocturnal pains, the patient was debilitated, he dragged his leg, and took short steps in walking. January 23rd, he came to me accompanied by a friend. I observed one and a half inches behind the right trochanter was painful upon pressure; the pain spread from this spot over the outer surfaces of the thigh to the knee, and along the anterior surfaces of the thigh to the knee. When the patient came home he had a slight pain which caused him to limp. After the application of a current he was free from pain, the right leg felt lighter and stronger; the pain returned on his way home, and again subsided till seven p.m., when he had another attack which lasted for two hours. He passed a bad night on the 24th of January; on getting up he had a return of the pain, which was removed by electro-galvanism and did not return till between seven and eight p.m. 25th, slight pain was felt over the anterior surface of the thigh, the induration behind the trochanter was nearly gone. 26th, the patient had no pain, but complained of a feeling of exhaustion. 27th, the patient continued to feel quite well, and had acquired his former healthy appearance. The treatment was discontinued.

Leatherhead, in his work on electricity, states what we believe to be an important truth; he says, "As far as my experience goes, it justifies me in saying that the importance of electricity as a remedy in many diseases is very much underrated. In cases of paralysis, and in obstinate and painful swellings, the consequence of old sprains, its employment is attended with results the most satisfactory." Fritter, after many experiments on medical electricity, came to the conclusion that the positive pole augments, while the negative diminishes the actions of life. He contends for the application of the negative pole to inflamed surfaces;

the parts would thus be deprived of the means for carrying on inflammatory action, and therefore could no longer have an existence. It may not be proper to depend entirely on electro-galvanism in cases of organic derangement, for we think these cases ought to be treated entirely on their own merits, and to have whatever medicinal remedies as the nature of the alleviations require. Wilkinson, in his lectures says, "Galvanism seems to be very useful in rheumatism, and several other diseases."

Mr. Noad, in his highly scientific and most useful lectures on electricity, remarks, "These are surely of sufficient importance to induce physicians to make a serious study of electro-physiological phenomena, in order that by persevering efforts science may be advanced, and a therapeutical method discovered applicable to the cure of disease, which unfortunately has hitherto resisted every other form of treatment." Such sentiments as these coming from a gentleman of such high scientific acquirement as Mr. Noad is reputed to be, is a sure evidence of the high value he sets on the beneficial influences of electricity in the cure of diseases; that is, when the science has been duly studied, and its phenomena perfectly understood and appreciated, so that it can be applied in a skilful and legitimate manner.

Electricity and its modifications are powerful agents in exciting contractions of the muscular fibre, as well as in the white contractile tissues, such as the muscular coats of the heart, uterus, intestines, arteries, and the bronchial tubes. Its influence over the uterus, we have most beneficently exhibited in cases of flooding—cases where no other stimulant has any direct influence over, and where the danger of the patient is most imminent. The converse of this state of the uterus is exhibited where it is again stimulated to a more healthy and energetic state, in cases of menorrhagia; in both of those latent conditions of the uterus, galvanism has a direct and invigorating influence over it—a power which no other medicinal agent we have possesses.

These remarks are more particularly applicable to those complaints, although its usefulness is not confined to those diseases which are in part of a functional character; in these we consider the judicious application of galvanism to be perfectly legitimate.

Take for example one of those cases of daily occurrence, of a person sitting at an open window, or anywhere exposed to cold draught or damp air; they are very soon after seized either with toothache, earache, or faceache, or aching pains in some of the bones or ligaments of the body; is there any remedy more safe, more likely to relieve, or it may be, cure any of those complaints? It is not understood generally to supersede, or to interfere with those judicious medicinal, dietetic, and other means, that the medical attendant may deem it necessary to employ: to do so would be foolishness itself. Whatever will tend to improve the general tone of the patient's health, will not only not find galvanism an opposing agent, but rather a highly valuable adjuvant. We have always remarked that after it has been employed about half-an-hour, these nervous patients begin to feel far more comfortable, more cheerful, and state that they feel a delightful glow of heat over the body, and that they are much stronger than when they began the operation: in others it has produced refreshing sleep.

Rheumatism is a disease peculiarly common in this country, depending in no small degree on the very variable and damp nature of our climate. It may appear in the bones with their investing membranes, or it may be in the muscular tissue, or their tendonous expansions, at other times in the ligaments, and as often in the nerves. Froriep says, in his work on the influence of galvanism in the cure of paralysis from rheumatism, that he depends much upon the swelling caused by effusion as being a leading feature in the paralysis which often ensues, whether of nerves or of muscles. This effusion is easily distinguished when situated in the cellular tissue, and may be a cause of the nervous distribution being weakened, as well as the loss of motion in the part; the power we have in modifying the strength of the application, and suiting it when necessary to even the infant at the breast. There is no medical agent that presents such facilities, such precision of application as this one, none that will rouse the dormant energies of our bodies like galvanic influence and none are so entirely alike to the principles which support the various functions of organic life, as galvanism is. The reason it is not much more generally resorted to, is a problem not easily solved; perhaps the fact that in its application for the cure of disease, it has been too much left in the hands of the quack who made it, and makes it still, a panacea for all diseases. This, however, is mere prejudice, and if generally applied to medicinal remedies when in the hands of such like people, then the use of medicines would be laid aside altogether. There is also the fear, and the prejudice, that galvanism is not a legitimate remedy in the cure of disease, except in very few instances, and even in these many think its claims are still very doubtful. After the number of great and most eminent men who have given their testimony to the contrary of these opinions, it is scarcely fair, and it deserves a better consideration than it has yet received from the medical profession generally.

Rheumatic neuralgic pains, so frequently mixed up with muscular rheumatism, are generally produced by being exposed to cold and damp wind, whereby the muscular currents become abstracted through the skin, and the nervous distribution of the part, suffers in a corresponding degree from the paralysing influence. That this is the real history of some the causes of the case, is evidenced by the relief afforded, by simply supplying that influence which the muscular fibres and the nervous system had been deprived of, for but a few applications is necessary before the pains in the muscles have disappeared. The nerve, or the branch implicated, very likely will require a more continued application before entire relief is afforded.

Galvanism is useful in rheumatism because of its peculiar power in restoring the healthy action of the skin, and in inducing a free and genial perspiration. We have the uncontradicted evidence of Humboldt, who made the experiments on himself, and he declares that the powers of the cutaneous vessels are augmented to such a degree, that the secretions continued for some time after the application of the metals had been discontinued. These effects are precisely what we have frequently experienced, more especially when the currents were continued longer than fifteen minutes. Its value in this particular instance, is best estimated, when we take into consideration the amount of disease produced in this most changeable climate, through the medium of the skin.

Our nervous system, and our bodies generally, are much influenced by the electric condition of the atmosphere; the changes of the quantity of this fluid in our air, has a powerful influence on the health and happiness of every one, indeed far more than is generally supposed. These instances are altogether apart from the severer forms of disease, which from time to time appear, and whose accession is marked by great electrical disturbances.

Alfred S., aged 53, shoe-maker, has been laid up for four weeks, having caught cold while working near to a broken window. He now complained of severe lancinating pains in his back, shooting down to the hip-joint, which was always increased after bed time; and complained of great stiffness and inability to move his back, or limbs; the parts had a hard and indurated feel, swollen but not discoloured; his general health had been moderate. Electricity was applied for an hour every evening, sparks were taken from the back; this gave moderate relief, and was continued for ten days; after that time galvanism was used, a sponge dipped in hot water, and connected with the wire from the positive pole, and applied alternately over the seats of pain: the feet were kept in warm water with salt, and the negative pole applied to them. This mode of treatment was steadily followed up, with a progressive improvement in all the circumstances of the case till, at the termination of four weeks, it was laid aside, the patient having entirely recovered.

Alexander B., a lad of delicate constitution, has had an attack of general rheumatism which left him very weak, particularly in the knees and ankle-joints, rendering him unable to walk without the assistance of another person; the parts felt so perfectly feeble that they had to be supported with bandages. He was put under the influence of electro-galvanism for three quarters of an hour daily, for the purpose of bringing up the constitutional debility, and in two weeks he was so much better, in that respect, as to enable us to turn our attention to the weakened joints; streams were now passed through the knee, and ankle, for an hour each day, and was continued in for four more weeks; he was then enabled to throw aside his bandages, walk without assistance, and in the course of another week return to his employment. This case is highly satisfactory in showing how the energising effects of galvanism not only rapidly instilled muscular power to the enfeebled limbs, but restored the general tone of health of this delicate and emaciated lad.

Mrs. W. A., aged 67 years, who had been (as she expressed herself) a regular martyr to this disease, principally in the shoulders, elbow-joints, and hands. At the time she came under our care she had been confined for ten weeks by reason of an attack from her old enemy. It was principally in the shoulders and wrists this time. She had tried a variety of favourite medicines, by which she was in some measure relieved, but the stiffness and inability to move the limbs rendered her very miserable. The skin and muscles around the shoulders were of a leaden hue, felt numb, stiff and hard, and the slightest movement of the joint gave her great pain. Gentle streams of galvanism were applied for an hour every day, and occasional sparks were taken from the shoulder and wrists, using for these days the ordinary electric machine and jar. On the first application slight pain was felt, but soon passed off, till ultimately it gave her so much relief that she asked to have it continued longer at each application. In twelve days she was much better, more free from pain, and could move the joints gently without an increase of the discomfort. By the end of the third week she could walk gently about the room; the stiffness was decidedly better, and continued improving till entirely free from pain and weakness; she was enabled to lay aside the remedy at the end of the fifth week.

At any rate, as the effusion becomes dispersed, the pain is less severe, and the power of motion very much improved. Professor Froriep, in paying more attention to the mere symptom of effusion than has hitherto been done, and by applying his remedy of galvanic puncture for its removal, has enabled him thereby to restore motion, and to relieve pain, with a degree of ease and rapidity, which has seldom been equalled anywhere.

## CHRONIC RHEUMATISM.

The use of galvanism in the cure of chronic rheumatism is simply to assist in removing the products of the more acute condition of the disease. Perhaps it may be effusion into the synovial membrane, lymph deposited around the fibrous tissues, or the consequent stiffness of the limbs, or joint, or it may be paralysis; the muscular tendonous and asseous systems are alike the seat of this most troublesome complaint; we may have thickening of the muscles effected, with much pain on motion, and there may be contractions produced of an involuntary nature, or paralysis less or more complete. Independent of the use of streams passed continuously through the part, and occasional sparks from the same, still the cure will be much facilitated by the daily use of the electro-galvanic friction; the absorption of the effusion, and the thickening, will be promoted, and muscular firmness will be acquired, and a larger amount of nervous force, or influence, will be diffused over the diseased parts, rendering patients able to use their limbs in a manner they had not enjoyed possibly for some time before. When the disease is in the muscular fibres, or ligaments, bones, or periosteum, the greater benefit will be derived by applying the galvanism by friction, the intensity of the application being carefully suited to all the merits of each individual case.

Alfred B., aged fourteen, of slender make, and of delicate constitution, had been confined with rheumatism for upwards of seven weeks. The attack had been principally confined to the knees, ankles, and wrist-joints; he was entirely unable to walk without the assistance of another person, and even then only a few paces; the joints felt weak, stiff, rigid, and were swollen and hard; he had been under treatment, but not regularly: the urine being still dark and acid, he was advised to continue the use of carbonate of potass which he had been taking irregularly for two or three weeks; streams from a weak battery were passed through each joint for a quarter of an hour daily, the operator then drawing a few sparks from each individual part for a few minutes longer, and the application finished each time by the use of the electric friction, and continued for just so long as the patient could allow, without suffering pain to any great amount; the joints felt warm and the skin was red after each application. This was repeated every alternate day for three weeks, when he was able to walk about the house without any support; the limbs still feeling rather weak, it was continued for ten days longer, and was then laid aside as being no longer required.

The benefits derived from the use of galvanism in this case are evident, and not to be mistaken, for not only were the pains and swelling removed, but the stiffness also was entirely relieved.

### FRICTIONAL ELECTRICITY.

A stout muscular man, aged 33, a wine cooper, had caught cold while working in the London Docks; had been confined five weeks with severe lancinating pains in both hip-joints; pains much increased during night — parts tender to the touch—shining and smooth on the surface—impossible to move the limbs without great increase of pain. The sponge from the wire of the positive electrode, after being dipped in hot salt and water, was applied to the seat of pain, the negative to the feet, and continued there for an hour daily. This was followed by the use of galvanic friction for several minutes longer every day, and was continued for three weeks, with a gradual and daily improvement, by which time he was able to walk about, and lay aside the galvanism.

In chronic muscular rheumatism, we have always found the greater relief from pain by means of electric friction, more particularly when applied to the pained muscles. It is also requisite that the currents be of low intensity. Sparks may also be drawn from the parts most deeply implicated. These measures may be continued in for not less than fifteen minutes at each application. When there is thickening, with a feeling of hardness in the parts, the use of the galvanic needles also will be found of the greatest possible service.

The use of frictional electricity is for the purpose of rousing the nervous energy of a given part, or of infusing into the muscular tissue that kind of stimulation, which is both natural to their states, and necessary for carrying on their various functions; there is also by this method a more definite idea in the mind of the operator of what is necessary to be accomplished, than we can by any means have in the use of embrocations, oils, or linaments. Apart altogether from the clumsy and unscientific nature of these so-called remedies, by the greasy nature of their composition, the secretions through the skin are arrested during all the time they are in use; whereas, when frictional electricity is employed, we have the functions of the skin strengthened by a natural stimulus, without in any way interfering, by arrestment of the functions of the emunatories. There can also be a precision in the application, as to force, quantity, and place, that can never be accomplished, even in an indifferent manner, by any greasy application whatever! the one is a natural remedy, the other a legacy from semi-barbaric ages, and altogether unbecoming the times we live in.

In general, it requires a few weeks' application to relieve the patient; but, in some cases, some months' application of the galvanic friction is necessary to restore health and vigour to the weakened joints. It is more a matter of care and of skilful appliance on the one hand, and patience on the part of the individual receiving the benefits, rather than any doubts existing, that the remedy will decidedly be successful. The streams will require to be very weak, so as to be easily borne, even by the most delicate, for a sufficient time at each application.

In the use of frictional electricity for the restoration of weak joints, it must be remembered that the currents situated in the muscular tissues are positive in their longitudinal direction, and negative in the transverse direction.

## GALVANIC NEEDLES.

Besides those modes of application we have taken notice of, we have the acu-galvanic needle most advantageously applied in the cure of tooth-ache. The same means are also found to answer for destroying certain kinds of *nevus materni;* for the dispersion of indolent tumours; schirrus of testicle, and for muscular contractions of various kinds; enlargement of the lymphatic glands, constipation of the bowels, intractable cases of ague, and chronic cases of swelled testicle.* In cases of obstructed secretion, arising from torpidity, it is used with much advantage.

In the use of the galvanic needles in chronic rheumatism of long standing, there is but little discomfort felt in the application; they are also used in varicose veins. It will be necessary to take the following directions into consideration as a proper means of application. The negative pole alone effects no coagulation; both poles together effect a slow, weak, and otherwise imperfect coagulation. The positive pole alone works out the effect quickly, safely, and completely. These deductions are entirely borne out by the experiments made by Baumgarten, and they may be fully relied on as perfectly accurate. It will also be found that a considerable separation of the two poles influences the action but little, provided that the intervening substance be a good conductor. In these directions we have evidence of the necessity of knowing correctly the proper mode of applying the needles, otherwise, it will end in failure, and it will be fortunate if no mischief is done.

---

* Mr. John Birch, hospital surgeon.

## NEURATIC SCIATICA

Consists first of augmented sensibility, and of augmented muscular contraction; or, in other words, of pain in the nerve, and of spasm and quivering of the muscles in which the nerve is distributed; afterwards there is numbness, or a sense of the pricking of pins and needles in the outer side of the foot. Added to this augmented muscular contractions, the effect of a disturbed state of the muscular currents. After these spasms pass off, it leaves a good deal of pain along the course of the nerve and muscles, and sometimes the pains are most intense.

The numbness left after the severity of the pain has disappeared, resembles that which is felt in the second stage of toothache. The plan of treatment, so far as electro-galvanism is concerned, is clearly indicated; the sponge positive will require to be applied to the lower part of the lumber region, and the negative to the inner surface of the knee. After a sufficient application of it in this manner, it is then advisible to employ the galvanic friction for at least ten minutes each time, to be specially employed over the muscles implicated.

In the Lancet for April, 1827, is related a case of sciatica in the person of Dr. Marchant. "He says, I shall abundantly be repaid, if even one individual shall experience the same relief from electricity which I have done, from the most violent paroxysms of the most painful description." After stating what medicine he had taken without the desired result, he was anxious to try some other remedy, and determined on electricity. He received sparks upon the parts affected, every morning and evening for fifteen minutes, and was very sensibly relieved, from the first application, and after using it three weeks, was entirely cured.

"Being convinced from the first application of electricity, that it would be of service, I gave up all other treatment, and depended on it alone, and I am happy to say that it answered my most sanguine expectations. I hope it will tend to bring electricity more generally into use, so as to prove useful in similar cases, as they are in some, protracted to a pitiable length of time." The Doctor's case had been existing for three months or more, and no wonder of his anxiety to try some other treatment, and speak so feelingly about these cases being of so long standing.

William J., a tailor, aged 27, had been confined with rheumatism nearly two months; he was still suffering acutely from pains extending from the lower lumber, and superior sacral vertebrae to the thigh, into, and over the thigh joint; the parts felt hard, were swollen, and immoveable. The pains were much aggravated during the night, he was therefore restless, and rather feverish. Leeches had been applied, with occasional doses of medicine, in the early part of the disease, with partial success. Electro-galvanism was administered for half-an-hour morning and evening; in twelve days the pain was much easier, but the swelling and stiffness still remained. Galvanic puncture was now used daily for fifteen minutes to the stiffened parts, and was continued for a week longer. This change in the remedy seemed to act very promptly in removing both symptoms, for by this time he was able to move gently about the house without much inconvenience. The same treatment was continued for ten days more, when he was able to walk about nearly in his usual state as when in health.

## GOUT.

We believe that wherever there is a weakened function in any given organ of the body, be that function or organ whatever it may, galvanism will be found a most effectual restorative for that debility; nor is this belief either unreasonable, or supported by insufficient evidence. Suppose we have it in the muscles, produced either by over fatigue, exhausting the currents circulating through these muscles, or perhaps the effect of some acute disease, such as rheumatism, still we have the same effect produced with some new combination, such as effusion, thickening of the parts, or perhaps paralysis.

When we know that a great number of gouty patients have their attacks brought on by some faulty state of the function of digestion, showing itself by some trifling article of diet, disagreeing with the patient, and thus introducing the disease—then galvanism, when applied to this primary condition, will be of the most essential service, in warding off the attacks, by curing the dyspeptic condition. How much agony and distress may be saved by taking this proceeding, and carefully following it up. We might cite many cases of this description, where the disease was managed in this primary state, and patients escaping their usual dose of gout.

In that variety of gout which has its origin and progress depending on derangement of the organs of digestion, caused in all probability by debility of that function, we have an excellent substitute, and a safe remedy in galvanism. Doubtless it will be found most necessary to use every approved means of diet and medicine, in conjunction, so that there may be a harmony, as it were, in the whole treatment. The pains in the stomach, with nausea, vomiting, eructations, depressed state of the nerves, are all symptoms denoting a debilitated state of the digestive organs, and call for some safe stimulating agent to rouse them to a more healthy condition. Its dyspeptic series of symptoms are truly characteristic of its nature, and of the safety and benefits likely to be derived from the use of this remedy.

The object in the prevention and treatment of gout in all its conditions, is to induce a healthy state of the stomach, intestines, kidneys, and skin; the various secretions and excretions being carefully watched, and if morbid, restored. Abstinence in moderation will also be found an occasional assistant in the cure; removing the noxious or morbid matter out of the system, will also be at all times a most necessary procedure; by this is not merely meant the morbific matters that may be accumulated in the stomach and bowels, or the diseased secretions that are so frequent in the biliary ducts, but also the deposits in the cellular tissue, in and around the various joints of the body, that we have to endeavour to remove. These deposits being composed of the urate of soda, differ in quantity in an inverse ratio, with the action of oxygen in the system; the more oxygen therefore taken into the system, whether by healthful exercise, diet, or medicine, or all of these harmoniously combined, the less likely it is that the patient will be a martyr to this most painful complaint.

Fechner, in some interesting experiments on the "contact theory," says, "If a piece of potassium or sodium be fixed in a solid manner by one of its ends to a platina forceps, while the other extremity be held by means of a wooden or ivory one; if after having well brightened it, it is surrounded by very pure oil of naptha, and the condensor be touched with the end of the platina forceps, no electrical sign is observable; while, if the naptha oil is taken off, and none remain adhering to the metal, this is observed to oxidise rapidly by the contact of the air, and the electricity indicated by the electroscope is of the most lively kind."

The ease with which urates combine with potass, or ammonia, would almost indicate a way by which deposits in the system may be acted upon by means of electro-galvanism. Mr. Groves says,* in reference to his most excellent Jasions voltaic battery, "The most interesting effect of this extraordinary battery, is the fact which it establishes, that gasses, in combining and acquiring a liquid form, evolve sufficient force to decompose a similar liquid, and cause it to acquire a gaseous form; for it has been proved, that the gasses evolved at the electrodes, are exactly equal to the quantity absorbed in each pair of tubes."

The electric fluid, when considered as a curative agent, has, I am afraid, got but little credit for its connection with, or dependence on, the many chemical changes that are continuously going on in the blood, as well as in the various secretions of our bodies; yet strange enough to say, few, if any, of these functions of life can be carried on without this fluid being either the active, or the passive agent, either acting, or being acted upon. When viewed from this aspect, this agent assumes a far more important position in relation to its influence on the animal economy, whether in health, or during disease, than is generally assigned to it. Yet this is its true position, and one which sooner or later it is certain to take. Hence its value as an adjuvant in the cure of such complaints as gout and rheumatism. Viewing it also in this light, we do not use it merely to strengthen this nerve, or that muscle, but to assist in restoring those weakened functions that are deficient, and to decompose, and rearrange those morbific secretions, in whatever form they may have been deposited, so as to allow of them either to be carried out of the body, or again taken up into the system in a more fitting and healthy condition than before.

---

* Noad's Electricity, p, 522.

## NARCOTICS.

The action of narcotics seems to be, at least in part, owing to their power in destroying the nervous sensibility, or in so narcotising the muscular tissues, as to leave them unfit to receive the ordinary healthful impressions. Galvanism is most beneficial and safe in those cases, for, by infusing a large amount of stimulation till sensibility is restored, and by keeping up this amount of healthful stimulation till the narcotism has died out, the person is thereby saved. In children suffering from over doses of laudanum, I consider it a most excellent remedy, and one that can be employed with the utmost ease and safety. The sponge from the positive electrode will require to be applied to the various portions of the spinal column, and the negative occasionally to the heart, diaphragm, lower extremities, &c.; sometimes, where the case is most urgent, weak currents may require to be passed through the head. The pneumagastric nerve will, under every circumstance, require to be put under the influence of the current. The position of the two electrodes while on the body of the patient, will at all times require to bear a corresponding relation to each other. Aloholic apoplexy will be cured by the same means, and the same mode of application of these means as in cases of narcotism.

Dr. Faraday, in one of his lectures, states, that nervous pewer may be converted into electric power, as clearly as electricity produces heat, why may not the converse of this also be true, than nervous influence may be generated by electricity, just as electricity producing heat, may in turn be reproduced by heat. The electric power of the torpedo is in a direct ratio with the nervous influence excited by that animal; and by frequent discharges of electricity, these animals die of exhaustion. Here is another direct and positive evidence of the identity of those two principles. Priestly anticipated all modern writers, as to their views regarding the agency of electricity in the production of vital phenomena.

## HYPOCHONDRIASIS.

In this complaint we have a series of symptoms all denoting severe nervous depression, and an absence of activity both in body and in mind, seeming to be more a deprivation of the forces of the *currents* proper, or the static electric force, than of any individual nerve, or nerves of the body. The entire group of symptoms are completely of a negative character, and of themselves tell the absolute state over the body of everything pertaining to nervous force, or electric energy. Every function in the unfortunate hypochondriac is negative. The taciturn manner, and the slowness of the patient's every movement, all show in an unmistakeable manner the utter want of the invigorating principle. The remedy in this complaint is therefore almost self-evident, and whatever success it may have in the hands of others, it has answered the purpose in mine. It may at once be mentioned, that it requires to be used for a long time, not less than six or nine months, before decided relief from the truly distressing depression of spirits entirely gives way; and in one case under our care it required to be gone on with for twelve months before the patient felt safe in leaving it off. The pleasant effects it has on the patient's mind and feelings, is so refreshing to them, that for the first six months, they have often declared, that the only pleasure they had was the hour they were daily receiving the pleasing and thrilling stimulus through their nervous system. The streams require to be rather feeble at first, and progressively increased as the health and strength of the patient improves; and no single application need be less than an hour. Beginning with the sponge from the positive pole, placed in the nuchæ, and every other week gradually shifted down the spine: the negative to be placed according to the circumstances of each case. Very probably there may be functional derangement of the liver, or the heart; in these cases it is proper to take the streams through these organs; or if it is in the stomach where the fault is, or the kidneys, or the skin, or in all of these, the application must then be made to have direct influence on those organs; infusing into each individual part that amount of nervous energy necessary for carrying on the healthy functions of life, and by again and again repeating that stimulus, and sustaining these functions in a healthy state of action. The heart and the circulating fluid will require the most careful consideration and attention. It will be found frequently of great service if the sponge from the negative electrode be applied between the seventh and eighth rib on the left side. Galvanism, by its stimulating influence over, and similarity to the nervous fluid, by its increasing the activity of the secretory vessels, by its improving the action of the heart, and also the capillaries, thereby restores the tone and balance of the circulation; it is thus calculated to bring an immense beneficial invigorating influence upon the whole fluids and tissues of the animal economy. This natural stimulating influence will require to be poured into the body daily.

## CHEMICAL EFFECTS ON HEMORRHAGE.

Voltaic electricity is certainly one of the most powerful, direct, and efficient means, the medical practitioner is in possession of, for staying the dangers of uterine hemorrhage. Apart altogether from its invigorating influences over the nervous and muscular tissues, as well as on the circulation, it seems also to act in a chemical point of view. According to Dr. Faraday, electro-chemical decomposition is occasioned by an *internal corpuscular action*, exerted according to the direction of the electric current, and is due to a force either *superadded to, or giving a direction to the ordinary chemical affinities* of the bodies present. He conceives the effects to arise from *forces* which are *internal*, relative to the matter under decomposition, and not *external*, as they might be considered if directly dependant upon the poles.*

When water and certain saline solutions are made part of the electric circuit, so that a current of electricity may pass through them, they are decomposed, that is, they yield up their elements in obedience to certain laws.

He shows by numerous experiments, and an irresistible mass of evidence, the truth of the important proposition, that the chemical power of a current of electricity is in direct proportion to the absolute quantity of electricity which passes; that the electricity which decomposes, and that which is evolved, by the decomposition of a certain quantity of matter, are alike; that the results obtained with *one substance*, do not merely agree amongst themselves, but also with those attained from *other substances*—the whole combining together into one series of definite electro-chemical actions.†

Considering the power that electro-galvanism has in inducing contractions of the muscular fibres, its usefulness in this class of troublesome, and sometimes dangerous occurrences, is clearly indicated, and its great value has been fully attested by many distinguised medical men of the present day. The remedy can be applied in a direct manner to the parts paralysed, giving it a decided advantage over every other means; its effects are immediate, and promptly felt—a matter of the highest importance in cases of this description, as the danger is imminent. Another preference it has, that while it brings on contractions, and thereby arrests the hemorrhage, it, at the same time, acts as a stimulant to the system generally, and saves, in a great measure, the necessity of giving other stimulants; it also diffuses a general heat over all the body—a matter of much importance, and of great comfort to the patient.

---

* Noad's Electricity, p. 371. † Ibid, p. 350.

All these experiments show, that apart from its powerful stimulating influences, there is an active chemical agency going on, and produced by the same means. One of these very likely taking place, is, a more healthy arrangement of the blood corpuscules.

That voltaic electricity should possess the power of arousing the circular, and sometimes the longitudinal fibres (as the case may be) of the uterus, is just what might be expected from its influencing, in the same manner, the various muscular fibres of the body.

This power at once indicates its usefulness in uterine hemorrhage. To produce the desired results (that of the arrestment of the hemorrhage by the contractions of the circular fibres), it is simply necessary to have a proper apparatus, and a person qualified by his knowledge of the agent employed, and the complaint for which it is to be used.

Regarding the vexed question, whether galvanism has the power of exciting uterine muscular contraction, *de novo,* I think it cannot be better answered than by the fact, that it can excite the muscular contractions of a limb, perfectly paralysed, and it does so in the uterus, by infusing into the tissues of that organ, that kind of nervous influence, or one most nearly allied to it, which it had lost by the flooding, the restoration of which, allows it to resume its powers of contraction; therefore, there can be no doubt but it has the power, either directly or indirectly.

In about a quarter of an hour to twenty minutes' application of the voltaic pile, a gradual heat seems generating, and diffusing itself over all the body, the patient being progressively relieved from a deathlike coldness, to one of a new life, as it were. Every experienced medical man who has had the anxious charge of cases of uterine hemorrhage, can well understand the meaning of this figure of speech. The application of galvanism for uterine hemorrhage, has decided claims, from the fact of its giving no inconvenience or trouble to the patient in its application; in this alone it has a decided preference to all other remedies used for the same purpose, but the certainty, and efficiency of the means, are what we have most particularly to deal with, and in neither qualities will it be found wanting.

That it is a most valuable remedy in the hour of need, has been well attested by those best acquainted with its powers and safety. We have the evidence of Dr. Radford, of Manchester, Dr. Lever, Mr. Wilson, of Runcorn, and Mr. Dempsey, of London, all declaring the benefits they have derived from it, even in some most desperate cases. I have been in the habit of using it in the same routine of cases; several of them had defied the powers usually resorted to, but yielded, in the most satisfactory manner, to the stimulating influences of galvanism. Certainly, in some of the cases in which I tried it, I found that the contractions of the circular fibres of the uterus were very much facilitated by the use of galvanic friction immediately over that organ, and *in a line with the fibres requiring stimulation.* The positive electrode being placed over that portion of the sacrum corresponding to the exit of the fifth and sixth sacral nerves, the negative being retained in one hand of the operator, while the friction is performed with the other, and continued till the uterus is felt contracted like a hard ball under the hand. It may be remarked that the use of galvanism does not in any way interfere with whatever other necessary means the medical attendant considers necessary.

## LOSS OF BLOOD,

From whatever the cause may be, can in many cases be left to the stimulating, and life-giving energy of galvanism. In uterine hemorrhage it has been used with the greatest advantage to the patient; this can very readily be imagined considering the direct influence this agent has, over the nervous, the muscular, and the circulatory system; we can at once understand how its usefulness must be of the utmost importance. By its immediate power the energies of the brain, and of the heart are kept up, till nutriment, and stimulants of various descriptions can be freely administered; muscular activity follows, and the bleeding ceases. In no series of cases is its life-giving power better exhibited than when used in uterine hemorrhage.

Cases have come under my notice where the powers of life were so nearly exhausted that it was necessary to continue the application of the galvanism for some hours, for the purpose of sustaining the ordinary functions of life; otherwise, the patients would certainly have died, if they had not received the continued impressions of this life-giving stimulation.

The phenomena of internal hemorrhage, like some others presented by disease, yields its quota of evidence in favour of the doctrines of the older philosophers, that in the blood of the being resides the life of it; and, like other doctrines of the same school, there is a good deal of truth in it, though not all the truth; for, although the blood is endowed with a full share of vital force, or energy, yet, in that fluid does not reside all the vital force of the individual, because individuals can be kept alive by galvanism after they have lost that amount of blood which, without this assistance, would have deprived the being of its life. The danger the patient has been in, is very well ascertained by the time taken, and the amount required of this vitality to restore them.

## DROWNING.

In the circumstance of drowning, there is no doubt that the death of the individual depends not a little upon the temperature of the water; the colder it happens to be, the sooner will the functions of life be suspended. Water, when forming itself into ice, parts with its latent heat, as well as a large amount of electricity. The death of the individual who may have been immersed in ice and water, must be very much accelerated by these two facts. By the withdrawal of so large an amount of heat and electricity, occurring from the circumstance of the body being positive in relation to the iced water, these, with the inability to respire, soon destroy life.

Neither electricity nor magnetism will suffice to meet the exigencies — they have not sufficient restoring power. Electro-galvanism, such as is got from one of Groves' batteries, answers best. The use of this remedy, as well as all the other usual remedies, will require to be continued such a sufficient time as will warrant success. The positive pole is better applied, by means of a sponge dipped in hot water, to the middle of the cervical vertebræ, occasionally shifting to immediately over the region of the heart. The opposite pole will be best applied to the feet by means of another hot sponge, or in hot water.

## ASPHYXIA.

"In the third or electric variety, the whole system seems to be, not so much rendered inirritable to stimulants, as to be suddenly exhausted of its entire stock of nervous power, like a Leyden phial, upon the application of the discharging-rod; in consequence of which, the limbs are flexible, the countenance pale, and the blood uncoagulate. The mode in which electricity is communicated is of little importance, for, if sufficiently powerful, real or apparent death is the consequence. Small doses of electricity prove a powerful stimulus to the nervous function, increases the flow of sensorial fluid, and augments the irritability of the muscles. Of all stimulants, that of electricity, or voltaism, seems to be especially called for in asphyxy." *

"A *proper* use of voltaic electricity is, in many instances, found highly serviceable as a nervous stimulant. The fluid should be transmitted along the channel of the nerves, from the *seat of the phrenic nerve*, in the neck, to that of the diaphragm, or of the parvagum, or great sympathetic nerve, immediately under the sterna-mastoid muscle, where they lie in a common sheath, and send forth branches to the heart. The application of voltaic electricity *surprisingly increases the power* of the muscles of respiration." †

## ON THE STATE OF SINKING,

Which occurs after operations, or after some severe accident, or, it may be, after some acute disease (as was well remarked by the late Sir Henry Halford), "where the resistance of the constitution, against the influence of the disease has been long protracted, or, if short, has been very violent." Sometimes it is the product of a great loss of blood. In all of these cases, there is evidently a want of nervous force necessary for carrying on the healthy functions of life. Under these circumstances, voltaic electricity can be made a valuable assistant, in pouring into the body that full amount of stimulus, necessary to give the patient a chance of rallying.

---

* Dr. Mason Good's "Study of Medicine," Vol. iii., p. 568.

† Ibid, Vol. iii., p. 643.

## CHOREA SANCTA VITI—ST. VITUS'S DANCE.

Another of those functional derangements of the reflex action, having its cause, probably in the stomach, or bowels, or, it may be, in the uterus, and sometimes it is connected with the spinal chord itself. It occurs generally in the weak and irritable, whose nervous systems are easily disturbed. If in any way connected with irritation of the stomach or bowels, these circumstances will require their own proper treatment. When these have been attended to, and the convulsive movements still remaining, it will be materially relieved, if not entirely cured by galvanism. If depending on uterine irritation, such as may arise from some functional disturbance therein, the application of electro-galvanism, through the means of the spinal nerves, with occasional sparks drawn from the body of the uterus, will be of the utmost service. As this complaint is frequently attended with costiveness and indigestion, it will be most desirable that these functions receive the healthful stimulation of the galvanic currents.

In this disease, as in many others, the purposes of cure will be much more readily accomplished, by currents of low intensity, but in full quantity, and long continued in, as a matter that is necessary for sustaining the functions, weakened by disease, in their healthful integrity. By a well-conducted course of the administration of galvanism, the nervous system will be much improved, and the disease under which the patient had been suffering, very probably eradicated.

## DEAFNESS.

In the application of electro-galvanism to any functional alteration of the ear, it is scarcely necessary to say, that, as in its use for the cure of amaurosis, a perfect knowledge of the anatomy of these organs is absolutely necessary, so the greatest care and nicety, is requisite in the appliances, and ought not to be entrusted into the hands of any one, but the experienced medical man; otherwise, what would be a valuable remedy, may be rendered as much to be dreaded as the disease.

Deficiency of hearing, when depending on mere functional defects, such as paralysis, arising from exposure to cold currents of air, or the result of sheer nervous debility, such as we frequently find in old people, are amongst those classes of complaints, that we contend are peculiarly suited to receive benefit from the *proper* application of electro-galvanism; the legitimate use of the remedy is only insisted on, not the indiscriminate abuse of it. In those cases of enervation, we are in the habit of applying a small piece of sponge, after being dipped in warm water and salt, and connected with the wire from the positive electrode, to the internal opening of the ear, and the negative, to the external opening, having a small plug so fitted, as will easily enter. The application may be continued from three to ten minutes, and even longer in some cases. Old people, being in general less sensitive than the young, will require the application to be continued a few minutes longer. The method, and place, to where the application should be made, will depend on whether the deafness, or the paralysis occur in any of the branches of the portia-mollis, or portia-dura of the seventh pair of nerves, or of the auricular branch of the third division of the fifth pair.

In some cases of deafness, related by Magendi, he used two silver wire conductors, each bent at one end, exactly in the direction of the *meatus auditorus*, and ending in a small knob, precisely fitting the auditory canal, which was covered with moistened linen. The rapidity with which currents pass through, and are communicated to the auditory nerve, generally occasion either a loud noise, or a tinkling sound. A feeble current must be used in these cases, and be continued, but for a few minutes. As a general rule, the stream may be gradually increased in strength, as the case progresses.

## ANEURISM.

Another benefit to be derived from the application of the galvanic pile, is the coagulation of the blood within an aneurismal tumour: this is founded on the experiment of Brand, who says, that "when the wires attached to the extremities of the trough, are introduced into any animal fluid containing albumen, the latter principle separates at the positive pole in a coagulated state." A case, in which a perfect cure was effected in an aneurism of the temporal artery, is related by Pehequin (*Comptes Rendus*, Nov. 3, 1845). Two needles were introduced into the tumour, and the power was gradually augmented to fifty pairs. At the end of twelve minutes the throbbing had entirely ceased, and the aneurism, with isochronous pulsations, was replaced by a solid and indurated tumour.

We have, as yet, said little in reference to the chemical action of electricity, but considering the influence this power possesses over the various secretions, and also in connection with the organs of nutrition, this force cannot be too well known and estimated. Its power is shown in the coagulating of the blood, in an aneurismal tumour, when the galvano needles are introduced; the same as when the wires are introduced into any animal fluid, where albumen is present, it will be found separated from that fluid, and at the positive pole in a coagulated state.

## TUMOURS.

Indolent scrofulitic tumours yield readily to the stimulus of the voltaic pile. Occurring as they do most generally in the young or middle-aged, they require constitutional treatment as well. In some cases, it answers very well to pass a pretty smart current through the tumour, and occasionally to draw sparks from the centre of them. Where, however, they are as large as a small apple, it is better to pass the needles into the centre; by this means you get the absorption much sooner accomplished, with very little marks left on the skin. This, however, will be very much facilitated, if the ordinary battery of Groves' is used, for stimulating the nervous and circulatory systems. It will be found much better, also, if the patient is put under this treatment for a week or two, before interfering with the tumour in any way. By this means, you get your patient into a more vigorous state of health, and the progress of the case will in every way be much more satisfactory. The langour of the circulation, so characteristic of this class of disease, will, in a material degree, be destroyed, and an amount of stimulus received into the system, as will insure a more ready return to a better state of health. It has been remarked that fatty tumours take a longer time to be brought under the influence of galvanism; it is therefore always well to apply the needles, after the tumour has been for several times having a series of currents passed through them, for at least half-an-hour each time, and in some cases, even an hour will not be found too long.

Dr. Amassae, jun., has published several cases on the use of electricity, in the treatment of tumours. One, a tumour on the tongue, was cured by this means. Two scirrhus tumours, one in the female breast, the other in the palm of the hand, were also cured in a similar manner.

In the *Medical Times*, of September, 1853, a case is reported of a young woman, twenty years of age, who had a vascular tumour over the nose, extending more to the left side than to the right, manifestly composed of convolutions of blood vessels, which could be traced by the finger. The patient referred the disease to a blow received three or four months before. Two galvano-needles were applied to those points of the tumour, where the pulsations were most apparent, supplied with energy from a battery of Bunsen, composed of thirty pairs of plates, and which was permitted to act for thirty minutes uninterruptedly. For the distance of a centimetre from the point of contact of the needle, connected with the positive pole, an inclination was felt, caused by the coagulation of the blood in the tortuous vessels of the part. The pain was very slight indeed. A similar application was effected eight days afterwards, in another part of the tumour, with the same results. In short, six sittings sufficed to arrest the pulsations, in the whole extent of the tumour, and to lead to the obliteration of the plexus of which it was composed. The hard parts became in time absorbed, without a recurrence of the permeality of the vessels. This case is referred to, not as a novelty of its kind, for the same is accomplished every day, but as showing the facility with which these troublesome tumours can be managed by means of galvanism.

M. Roux relates the case of a young woman, eighteen years of age, who had been subject to a tumour of the vertebrae column for two years, which had brought complete loss of feeling and motion in the lower extremities. When she was on the point of leaving the "Hospital Charite," after having remained there for some months, without any prospect of relief, M. Roux performed electropuncturation, by directing, in the course of the spinal marrow, across the body of the vertebrae, and which was then placed in contact with the voltaic pile. The patient almost immediately experienced a sense of tickling, at the extremities of the toes, and soon recovered the power of using them in a slight degree. This power extended successively to the fingers and to the legs, so as ultimately to allow the patient to walk without crutches.

In indolent tumours of moderate size, the use of the galvano-needles are employed almost every day, and are, in the hands of those who know how to apply them properly, found to be a very efficient remedy, and a safe one. In other cases, shocks made to pass through the tumour, for at least fifteen minutes consecutively, is found to be a convenient and efficient remedy. Those of the female breast readily yield to this mode of application.

## ENLARGED MAMMARY GLANDS

Are frequently very irritable and troublesome, and when occurring in patients, whose health is rather indifferent, becomes a matter of much anxiety to all interested in the welfare of the patient. There is also much suspicion and importance attached to them at this period, more especially if the invalid is about the turn of life. Such a case as this came under my care in March of the present year, in a middle-aged maiden lady, who had been confined during the whole winter with bronchitis; as a sequel, she had giddiness in the head, and numbness of the right arm, for which she had been galvanised four times, and with much benefit.

She then told me of two tumours, as she called them, which had troubled her for about two months. The left was the larger of the two, and about the size of an egg. She complained of severe lancinating pains extending into the shoulder. It was loose, and in no way attached to the ribs. There was little discolouration of the skin, neither was there any puckering of it; still she was very anxious about it, as it gave her a great deal of pain. They had been poulticed with bread and water for about a fortnight, which treatment gave her slight relief, but they continued to enlarge. A paste, composed of six parts of ex-hyosciam, with one of iodine, was well rubbed in a little spirits, and laid on with a camel-hair brush, and repeated every day. In two weeks of this application neither the swelling nor the pain was allayed. Galvanism was then had recourse to—the negative electrode being placed in the patient's right hand, the positive in the medical attendant's left hand, and, with the fingers of the right hand, gently holding the enlarged gland between them, allowing the stream thereby to pass right through it. This was continued for twenty minutes, and the same routine was precisely followed, with the gland in the right mamma, and for the same length of time. She called again in a week, saying the swelling and pain in the right breast had entirely disappeared, and the left breast, being always the worst of the two, was reduced three-fourths, and the pain gone. The treatment was therefore repeated in the same manner as before, and she called in two weeks afterwards, saying, that both enlargements, with their accompanying pains, had entirely disappeared, and for which she was truly grateful, as she had been very much alarmed about them.

## CHRONIC MAMMARY TUMOURS

Of the breast, is an affection occurring occasionally in young people, and in the great majority of them, have a close relation to, and dependence on, uterine irritation, and principally at the catamenial periods. This class of tumours is found on the surface of the mamma, and moveable over that surface, and lobulated. When painful. they frequently shoot into the shoulder. I have found that moderately strong sparks, passed through the tumour three times a week for a month, or sometimes longer, are quite sufficient for their dispersion. Some have disappeared in a much shorter time. In all those cases depending on uterine irritation, it will be found of great advantage, if frictional galvanism be applied over the uterus daily, for twenty minutes, till two or three monthly periods have passed over.

By this means the patient will be freed of a great deal of pain occurring at these periods; the catamenial flow will be regulated to a healthful quantity, and the general health and comfort of the patient will be restored. Sometimes, in cases of long standing, the pains at certain periods are as violent as some of those in labour: those cases will require the galvanic friction over the abdomen to be used morning and evening, for not less than half-an-hour each time, during the paroxymal periods. It will also be desirable to pass rather strong streams, from the lower portion of the lumber and upper sacral vertebrae, through the body of the uterus, and it is better to do this as a preliminary, to the use of the frictions.

## SCIRRHUS TESTIS.

A sergeant of the Sussex militia was sent to the hospital with scirrhus testis, which the late Mr. Bayford condemned to the knife, as indeed any experienced surgeon, *unacquainted with the powers of electricity would have done.* I thought proper to try the effects of strong shocks in this case. The first produced pain; on repeating them the third day, some fever arose; I sent the man to quarters at Newington, where he speedily recovered. I then found the mass of tumour beginning to part into portions; I then passed weaker shocks, which agreed very well with him, and the testis were gradually diminishing: but willing to know if the larger shocks were the cause of his first fever, I passed one; his pain was great, and fever returned. Afterwards the testis were diminished, and small shocks daily completed his cure.

A negro servant was admitted into the hospital, under Dr. Blane's care, with a scirrhus testis. The doctor desired to try the electric shock, which was administered in the same manner as in the former case, and he was presented out of the hospital in two months.

A coachman was seized with so violent an inflammation of the testis, that a liberal use of bleeding, evacuations, and opiates, gave him no relief. On the third day I found that it would terminate in an abscess; to prevent which I proposed to pass small electric shocks through the part, which I accordingly did; the first was followed by some respite of pain. I repeated them every four hours, and the next day the pain and inflammation had so much subsided that the fear of suppuration vanished. The shocks were continued, and in two weeks he was well.

## SCROFULA.

James B., aged $7\frac{1}{2}$ years, a sallow-complexioned, fair-haired boy, with beautiful blue eyes, had been complaining for about eighteen months with enlarged mesenteric glands, and more recently with a scrofulitic ulcer in the right groin; there were also a general enlargement of all the glands, in and around the neck. He had been using cod-liver oil, with small doses of iodine, in combination with full doses of the sesquichlorate of iron. These having had a fair trial, and failed, it was thought proper to try the influence of electro-galvanism upon him—the iron and iodine being continued. Streams were passed through the system generally, for twenty minutes, for ten through the enlarged glands, and as long through the ulcer in the groin. This was gone on with for two months, with great improvement in the general health, and an entire obliteration of the enlargement of the glands; still the sore in the groin discharged too much. A delicate battery, composed of a silver plate, of four inches by three, and a platina plate of the same dimensions was applied; the former was placed over the sore, and kept in that situation for four days, it then looked cleaner and drier, and was filling up. It was kept in the same position for another six days, when healthy granulation having set in, and the ulcer two-thirds healed up, he was allowed to lay it aside, and to walk out every day. The galvanism was continued for the neck, and the system generally, till the end of the twelfth week, when he went to the country in a highly improved state—the sore was level with the skin, and the neck was entirely free from any enlargement.

W. T., aged 10 years, a delicate boy, of scrofulitic temperament, came under our care, while suffering from a scrofulitic sore on the neck, and another on the back of the hand, both being on the right side. He was using cod-liver oil, and was requested to continue it. There was a general state of languor, with debility over all the system. The electro-galvanism was first applied every day; the positive electrode was placed in the nuchæ, and the sponge from the negative wire to the lower margin of the stomach, and continued in that position for ten and sometimes fifteen minutes. This mode of treatment was continued for four weeks, for the purpose of establishing a higher degree of energy in the body, and to restore tone to the organs of nutrition. These matters being satisfactorily arranged, the plate from the small battery, used only for ulcers, was first applied to the neck, and continued there for two weeks, taking care to have it cleaned in the usual manner; the sore was then in a most healthy state, and filling up rapidly, but it was considered that it would require the further stimulation of the galvanic plate for ten days more, which was done without any pain, and very little trouble. It was also evident the application ought now to be transferred to the hand, and, considering the situation of the sore, we considered it would be better to let it be the last, so that the stimulation of the galvanism might have its due weight on the general health, and by improvement, that a corresponding advantage would be derived, and the healing process so much the more facilitated. Still, with these advantages, we expected that this sore would be longer in healing than in the neck, which turned out to be the case. The same method of application was gone through, yet it took four weeks and three days before the sore was level with the skin, and before the plates could be laid aside.

## ULCERS.

The benefits derived from the use of electro-galvanism, in the cure of ulcers, are entirely derived from, and dependent on its stimulating powers. Its stimulus is unlike all other stimulants, because it acts upon individual organs at our will, and leaves no corresponding depression, when its influence no longer continues. It can be made to act upon this muscle, or that nerve, or indeed upon any individual organ, wherever its situation may be. These are the great advantages of galvanism—its invigorating power, its similarity to nervous influence, the rapidity of transmitting its beneficial influences, the precision with which it can be applied upon any individual organ.

James Y., aged 39, a soldier from the Madras army, had been invalided, in consequence of large immovable ulcers in both legs, and which had resisted every application that could be devised for them, for upwards of two years. There were varicose veins on both limbs. He considered the sores brought on by long and fatiguing marches, and wearing tight garters. There was no doubt but that the varicose veins, and the ulcers, were depending on the same cause for their origin, and in part for their continuance. The sores were impeded in their healing, from the state of the veins. It was deemed necessary to apply the needles to the veins in the usual manner. A silver and a platina one were introduced nearly opposite to each other, and then connected with one of Bunsen's batteries, and sustained in position a few minutes after the connection had been formed. This application had reference only to the vena saphena. Pledgets of lint, soaked in cold water, were applied after, and the patient kept in bed for a week, when we found the vein completely obleted, and at once set our apparatus in order, to apply them to the ulcer. The silver plate was applied over the larger sore, which had been previously carefully bathed with warm water, and then covered with a wet linen rag. The plate from the negative pole was fixed with adhesive plaster a few inches further down the leg. The plate over the sore was taken off morning and evening; the ulcer and the plate being carefully cleaned. On the seventh day the sore had healed up to a level with the skin, looked dry and healthy, and required no other treatment than some simple dressing.

Mrs. L., aged 57, of scorbutic habit of body, had a large, flabby, and indolent-looking sore, on the front surface of the right limb, about three inches above the ankle-joint. She mentioned that she had been occasionally troubled with sores over those parts while she was bearing children; they were now, however, much more difficult to heal. The present ulcer had been in existence upwards of two years, was several times nearly healed, but again became worse. Her general health being indifferent, she was put under a course of tonics, with a highly stimulating diet, and the use of malt liquor, in proper quantities, was allowed. The sore being large, the electro-galvanic plate was applied to the lower half only, and was continued, so applied, for ten days, except when taken off daily to be cleaned, and the sore bathed. It now looked a great deal cleaner, was nearly dry, and three-fourths of its depth was filled up by healthy granulations. The positive plate was again placed over it for four days more, and was then ultimately removed, the ulcer being healed up entirely on a level with the skin. Simple dressing, and an elastic stocking, was recommended as all that was necessary.

In conclusion it may well be asked, What in nature can equal in rapidity the lightning flash? No chemical or other agent can equal in power this great momentous principle. Its effects are so mighty, so many, and so various, that it may be said, without exaggeration, that whether we look to the heavens above, or to the earth beneath, we can scarcely perceive anything, that is not acted upon, or in a manner subject to, the operations and influences of this wonderful fluid. A late author remarked, "that it is almost impossible not to believe it to be the soul of the material world."

BEARE & JEALOUS, Printers, Great Northern Press, Gray's Inn Road.

[illegible]